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EFFECTS OF POLLUTION ON WATER QUALITY, ESCAMBIA RIVER AND BAY, FLORIDA

Federal Water Pollution Control Administration
Athens, Georgia

January 1970

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ESCAMBIA RIVER AND BAY, FLORIDA

January 1970

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U. S. Department of the Interior
Federal Water Pollution Control Administration
Southeast Water Laboratory
Technical Services Program
Athens, Georgia

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I. INTRODUCTION

In August 1969, the Southeast Region of the Federal Water Pollution Control Administration received a request for technical assistance in evaluating interstate and intrastate pollution from waste sources entering the Conecuh-Escambia River downstream of Brewton, Alabama, and Escambia Bay near Pensacola, Florida. This request was transmitted from the Governor of Florida through the Florida Department of Air and Water Pollution Control. An investigation of waste sources in Florida and Alabama and a detailed study of the receiving waters were conducted during the period of September 8-25, 1969 and October 22-30, 1969. This report presents an evaluation of the data collected during these studies.

The cooperation and contributions of various State, local and private organizations are gratefully appreciated. Particular acknowledgements are due to personnel and students of the University of West Florida and to the Bureau of Sanitary Engineering of the Florida Department of Health and Rehabilitative Services as well as the Florida Department of Air and Water Pollution Control and the Alabama Water Improvement Commission.

II. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The area considered in this report is the Conecuh-Escambia River in Alabama and Florida downstream from Brewton, Alabama, and Escambia Bay as well as Mulat-Mulatto Bayou in Florida.

The entire upper section of Escambia Bay north of the L & N railroad bridge is in a state of accelerated eutrophication as shown by unstable dissolved oxygen variations resulting from algal activity; high carbon, nitrogen and phosphorus concentrations; and oxygen demanding sludge deposits. Dissolved oxygen at the bottom of nearly half of the bay was less than the 4.0 mg/l criterion established by the State of Florida for these waters. The closely spaced piling under the L & N bridge adversely inhibits circulation, flushing and exchange between the upper and lower bay. In Mulat-Mulatto Bayou, dredging and filling for interstate highway construction and residential development, in addition to the above conditions, also contribute to degraded water quality. These conditions are the major causes of the numerous fish kills reported in Escambia Bay and Mulat-Mulatto Bayou during 1969.

The lower section of the bay south of the L & N bridge also has degraded water quality, primarily due to sludge deposits. The only factor preventing an identical condition as that of upper

Escambia Bay is the flushing and exchange of pollution out of the area in a relatively short period of time.

These water quality conditions in Escambia Bay and Mulat-Mulatto Bayou are caused by the discharge of carbonaceous, nitrogenous and phosphorus wastes from the following sources in Florida; Escambia Chemical Company, American Cyanamid Company, Monsanto Company, the City of Pensacola Northeast sewage treatment plant; and the Container Corporation of America in Brewton, Alabama. The total amount of pollution discharged from these five sources is more than 136,000 population equivalents of carbonaceous wastes; 651,000 population equivalents of nitrogenous wastes; and 135,000 population equivalents of phosphorus wastes.

The major dischargers of carbonaceous wastes are the Monsanto Company, Container Corporation and American Cyanamid. Escambia Chemical Company, American Cyanamid and Monsanto Company are the principal contributors of nitrogenous waste to Escambia Bay. The Pensacola Northeast sewage treatment plant also discharges significant amounts of nitrogenous material. Monsanto Company and Escambia Chemical discharge most of the phosphorus, although the Northeast sewage treatment plant is also a significant source.

Container Corporation of America and the City of Pensacola Northeast sewage treatment plant reportedly provide about 80% removal of their carbonaceous waste at the present time. Furthermore, approximately four fifths of the residual carbonaceous waste from Container Corporation is stabilized in the Escambia River before reaching Escambia Bay. American Cyanamid has a primary treatment facility. It is estimated that American Cyanamid removes about 37% of its carbonaceous waste. Both Escambia Chemical and Monsanto provide no treatment to the waste effluents evaluated in this report.

American Cyanamid Company also discharges acrylonitrile. This compound is toxic to fish. Although it has not been directly demonstrated, the wastes from American Cyanamid could be directly responsible for some of the fish kills occurring in the north and northeast sections of Escambia Bay.

The heat discharged in the cooling water effluents from the Monsanto Company and Gulf Power Company is such that the temperature of the Escambia River is increased above the recommendations of the National Technical Advisory Committee to the Secretary of the Interior which specify a maximum increase of 4°F from September through May and 1.5°F from June through August. Monsanto's cooling water increased the surface temperature of the Escambia River by 19.5°F immediately downstream from the outfall. Three-hundred yards downstream from the Monsanto outfall, surface water temperatures were 7°F greater than background. The Gulf Power effluent increased the surface river temperature by 12.25°F.

Benthic fauna in the Escambia River at the Alabama-Florida State line near Century, Florida, showed no significant damage from waste sources above the State line during the October 1969 field investigations. However, during extended periods of extreme low flow in the Escambia River near Century, Florida, (1966 and 1968), wastes from upstream sources in Alabama degraded the habitat to a level sufficient to appreciably affect the diversity of the biota at the Alabama-Florida State line. Dissolved oxygen levels at the Alabama-Florida State line were above 4.0 mg/l at all times during 1969.

Color in the Escambia River was increased from 70 units to about 120 units from Brewton, Alabama, to Century, Florida. This color increase results from the discharge of treated industrial waste from Container Corporation of America. The official water quality criteria of the States of Florida and Alabama require that no color producing substances causing deleterious effects be discharged to receiving waters.

Waste discharges to the Escambia River and Escambia Bay in the States of Alabama and Florida cause pollution which endangers the health or welfare of persons in Florida and, therefore, are subject to abatement under the provisions of Section 10 of the Federal Water Pollution Control Act as amended (33 USC 466 et seq.).

B. RECOMMENDATIONS

To reduce or eliminate the accelerated eutrophication of Escambia Bay and Mulat-Mulatto Bayou, and to provide water quality suitable for a wide diversity of desirable uses, the following water quality management and waste abatement program is recommended:

1) Minimum reductions amounting to 94% carbonaceous, 94% nitrogenous, and 90% phosphorus wastes respectively discharged to Escambia River and Bay from all sources. All waste sources provide complete removal of settleable solids. The allowable waste discharges from each of the major sources listed are as follows:

SOURCE	CARBONACEOUS		NITROGENOUS			PHOSPHORUS	
	5-Day BOD	TOC	TKN	NH_3-N	NO_2NO_3-N	Total	Ortho
American Cyanamid	425	500	249	32	42	-	-
Container Corp.	2230*	3120*	30	12	-	17	8
Escambia Chemical	17	12	197	137	143	35	35
Monsanto	605	282	102	66	80	46	29
Northeast STP	137	39	101	84	-	23	12
TOTAL	3414	3953	679	331	265	121	84

BOD = biochemical oxygen demand

TOC = total organic nitrogen

TKN = total Kjeldahl nitrogen

NH_3-N = ammonia nitrogen

NO_2, NO_3-N = nitrite-nitrate nitrogen

---

*The contribution to Escambia Bay from this effluent will be 450 pounds per day of five-day BOD and 625 pounds per day of TOC.

The recommended alternative for accomplishing these objectives is the construction of a sewer collection system around the entire bay to intercept wastes from American Cyanamid, Escambia Chemical, Monsanto and Northeast sewage treatment plant as well as future and minor present effluents. This is consistent with the concept of metropolitan planning for waste management. All domestic and industrial wastes to be treated at a central facility with discharge away from Escambia Bay after the recommended carbon, nitrogen and phosphorus reductions have been accomplished.

2) Color in the Escambia River at the Alabama-Florida State line as measured at the Highway 4 bridge near Century, Florida, reduced to background levels measured above the Container Corporation of America discharge.

3) No further construction dredging permitted in Escambia Bay or Mulat-Mulatto Bayou until a plan for development of the shoreline has been established. At that time, construction dredging permitted only in accordance with this plan, to be completed within one year by representatives of Escambia and Santa Rosa Counties, the City of Pensacola, the State of Florida, the U. S. Army Corps of Engineers and the U. S. Department of the Interior. Any necessary maintenance dredging in the interim conducted by diking the dredging area. Maintenance of existing channels by hydraulic pipeline dredging only. Disposal of all dredged material to upland spoil sites.

4) The L & N railroad bridge across Escambia Bay to be rebuilt, by not later than January 1, 1973, to eliminate the piling presently adversely affecting the circulation and exchange of water in the bay.

5) The American Cyanamid Company immediately reduce acrylonitrile concentrations in its waste effluent below 10% of the levels demonstrated to be toxic to fish.

6) The Monsanto Company and Gulf Power Company, by not later than January 1, 1973, abate the excessive heat being discharged in their respective cooling water effluents.

7) Century, Florida, install secondary waste abatement facilities and provide effective disinfection of wastes at all times.

C. WASTE ABATEMENT SCHEDULE

Two alternatives are presented to comply with the waste abatement recommendations: a central facility which will accept wastes from all sources in the Escambia Bay area for carbonaceous, nitrogenous and phosphate removals; or individual waste reduction, amounting to at least 90% removal of carbonaceous material for each waste source, in addition to a central tertiary treatment facility designed for further carbonaceous reductions as well as nitrogen and phosphorus removal. Waste abatement facilities removing 90% carbonaceous material must be completed and in operation by January 1, 1973 in order to comply with the implementation schedule set by the State of Florida. Alabama's implementation schedule specifies February 15, 1973 as the final date for completion and operation of waste abatement facilities.

III. AREA

Escambia Bay

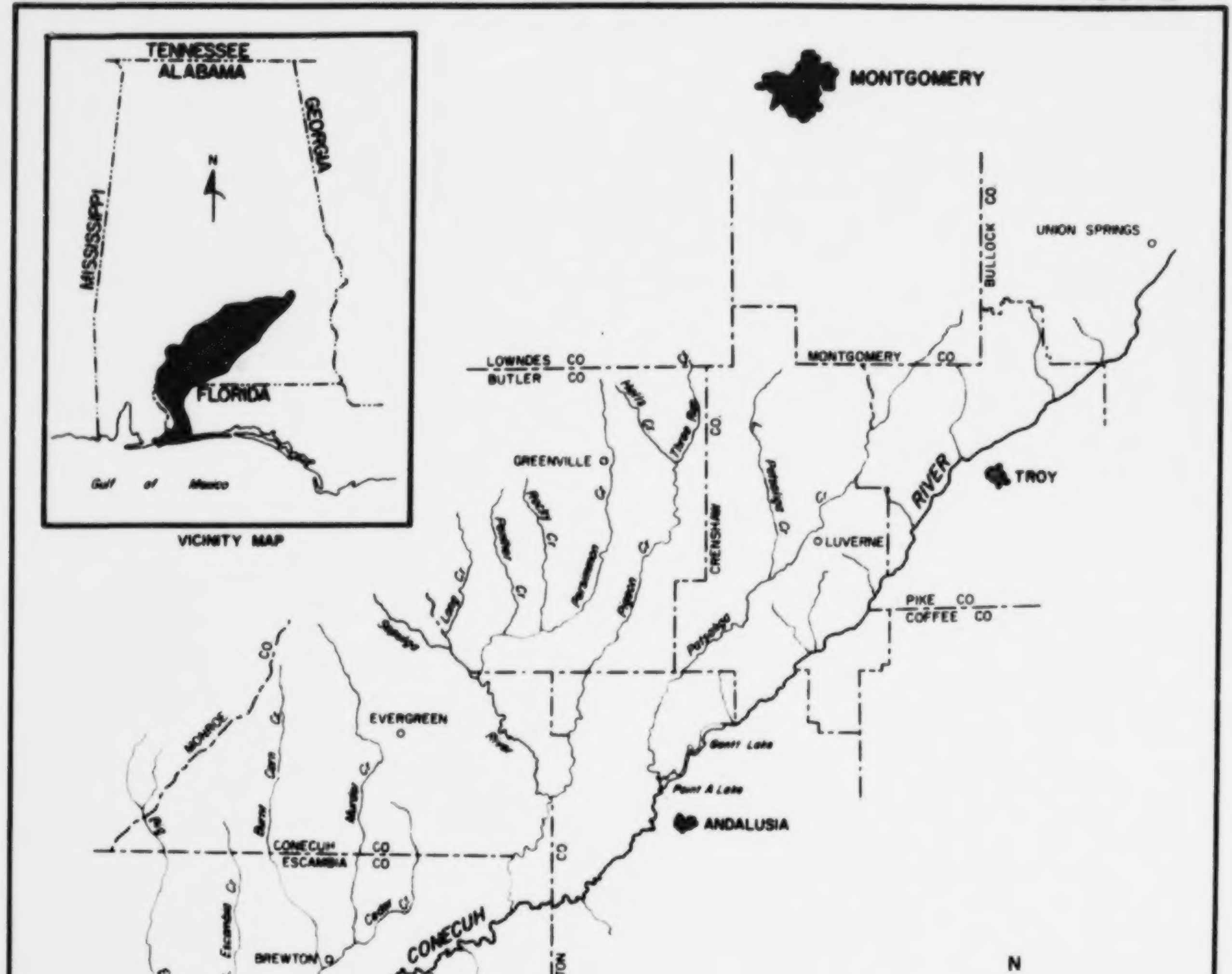
Escambia Bay is one of the northeast branches of Pensacola Bay. It is a shallow estuary with depths ranging from three to about 15 feet. A north-south ship channel, maintained at a depth of 10 feet at mean low water, allows barge traffic to navigate into the Escambia River. The study area is shown in Figure 1.

Pensacola, the largest city in the area, lies along the northern shore of Pensacola Bay. The population of the metropolitan area is 224,000 (1965)(1). The mean annual temperature at Pensacola is 68.4°F and the average annual rainfall is 62.9 inches. Mean wind velocities vary from 8.5 to 6.1 miles per hour for the months of January and July, respectively.

Fresh water enters Escambia Bay from the Escambia River which has the fifth largest average flow in Florida(2). The river drainage basin includes 3800 square miles of southeast Alabama and northwest Florida. The major portion of the drainage basin lies in Alabama and is characterized by hilly terrain with many perennial streams. The flat swampy river delta has dense vegetation which causes the river to meander with sluggish velocity.

Ground water, which is plentiful and of good quality, is the primary source for municipal and industrial supplies. A sand and gravel aquifer lies 200 to 1000 feet below land surface and yields large quantities of soft, unmineralized water. Below the sand and gravel aquifer lies the Floridian limestone aquifer, which is virtually

FIGURE 1



TENNESSEE
ALABAMA
GEORGIA
MISSISSIPPI
FLORIDA
N
Gulf of Mexico
VICINITY MAP
MONTGOMERY
BULLOCK CO
UNION SPRINGS
LOWNDES CO
BUTLER CO
MONTGOMERY CO
GREENVILLE
CRENSHAW CO
TROY
LUVERNE
RIVER
PIKE CO
COFFEE CO
EVERGREEN
MONROE CO
Gantt Lake
Point A Lake
ANDALUSIA
CONECUH CO
ESCAMBIA CO
COVINGTON CO
BREWTON
CONECUH
FLOMATON
ESCAMBIA CO
ALABAMA
FLORIDA
CENTURY
ESCAMBIA
RIVER
SANTA ROSA CO
OKALOOSA CO
CANTONMENT
PACE
PENSACOLA
East Bay
Gulf of Mexico
N
SCALE
IN MILES
10
0
10
20

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

STUDY AREA

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

untouched in this area. The sand and gravel aquifer is recharged by rainfall within the drainage basin and provides base flows in the surface streams during drought conditions.

During the Escambia Bay field investigations, air temperatures at Pensacola averaged from 75 to 78°F with a maximum of 85°F on the 25th of September and a minimum of 67°F on the 24th of September. These average temperatures are slightly below the monthly mean for September which is 78.2°F. Fog and smoke or haze were reported for this period as well as sky cover ranging from 80 to 100%.

No rainfall occurred at Pensacola during the sampling of Escambia Bay, although several days earlier a tropical depression from the Gulf caused heavy rains to the north and east of the area. Pensacola reported a total of 0.59 inches from this storm while three to four inches were reported across the headwaters of the Escambia River. Although normal rainfall for September is 7.69 inches, only 3.09 inches were recorded for September 1969, a deficiency of 4.60 inches for the month.

Winds were generally absent at night and calm to moderate during daylight hours. Velocities at Pensacola ranged from 3.8 to 5.9 mph with maximum velocity measured at 13 mph on the 23rd of September.

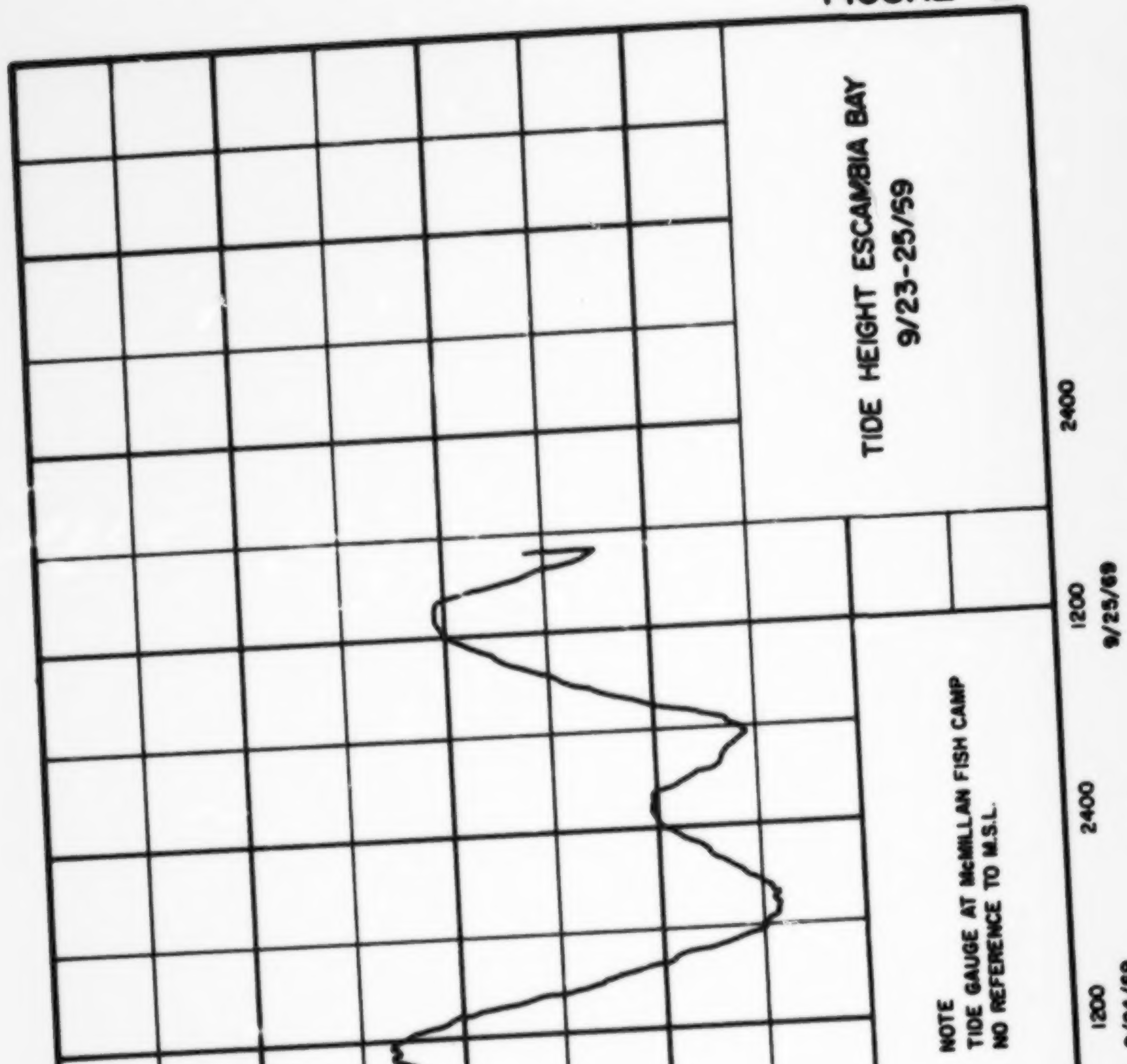
Flows on the Escambia River near Century during the Escambia Bay field study were recorded as follows:

Date	Av. Daily Flow (cfs)
9/17	932
18	914
19	914
20	1030
21	1260
22	3960
23	9130
24	11,600
25	11,500

The high flows were a result of the heavy rains of September 19th and 20th in the upper part of the basin. Since time of water travel from Century to the headwaters of the bay is estimated at about four days, the higher flows reported at the Century gage did not affect the waters of Escambia Bay during the sampling period. Low flows were about usual for this time of the year.

Tide gages were established during the field operations at Smith's Fish Camp on the Escambia River and at McMillan's Fish Camp on Mulatto Bayou. The data from these gages were used in conjunction with data from the official tide gage at Pensacola. Figure 2 shows the tidal variation during the study period at McMillan's Fish Camp. Spring tides occur at a frequency of twice a year at Pensacola. Inspection of Figure 2 shows that spring tide occurred on September 23rd cresting at about 11:00 am at one foot higher than other high tides measured during the study period. During the 24-hour period between 6:00 pm on the 24th and 6:00 pm on the 25th of September, two complete tidal cycles were experienced rather than the normal diurnal tide cycle of one per 26 hours. Escambia Bay has a greater tidal range than Pensacola Bay, shown by comparison of predicted tide height in Pensacola with those measured in upper Escambia Bay.

FIGURE 2



TIDE HEIGHT ESCAMBIA BAY
9/23-25/59

NOTE
TIDE GAUGE AT McMILLAN FISH CAMP
NO REFERENCE TO M.S.L.

12-A

Escambia River

The Escambia River is formed by the junction of the Conecuh River and Escambia Creek just north of the Alabama-Florida state line. The Conecuh River, larger of the two tributaries, rises in Bullock County, Alabama, and flows southwest through Pike, Crenshaw, Covington and Escambia Counties, Alabama. The main stem of the Escambia River, south of the Alabama-Florida state line, forms the boundary line between Santa Rosa and Escambia Counties, Florida, and flowing almost directly south terminates in Escambia Bay east of Pensacola, Florida (Figure 3).

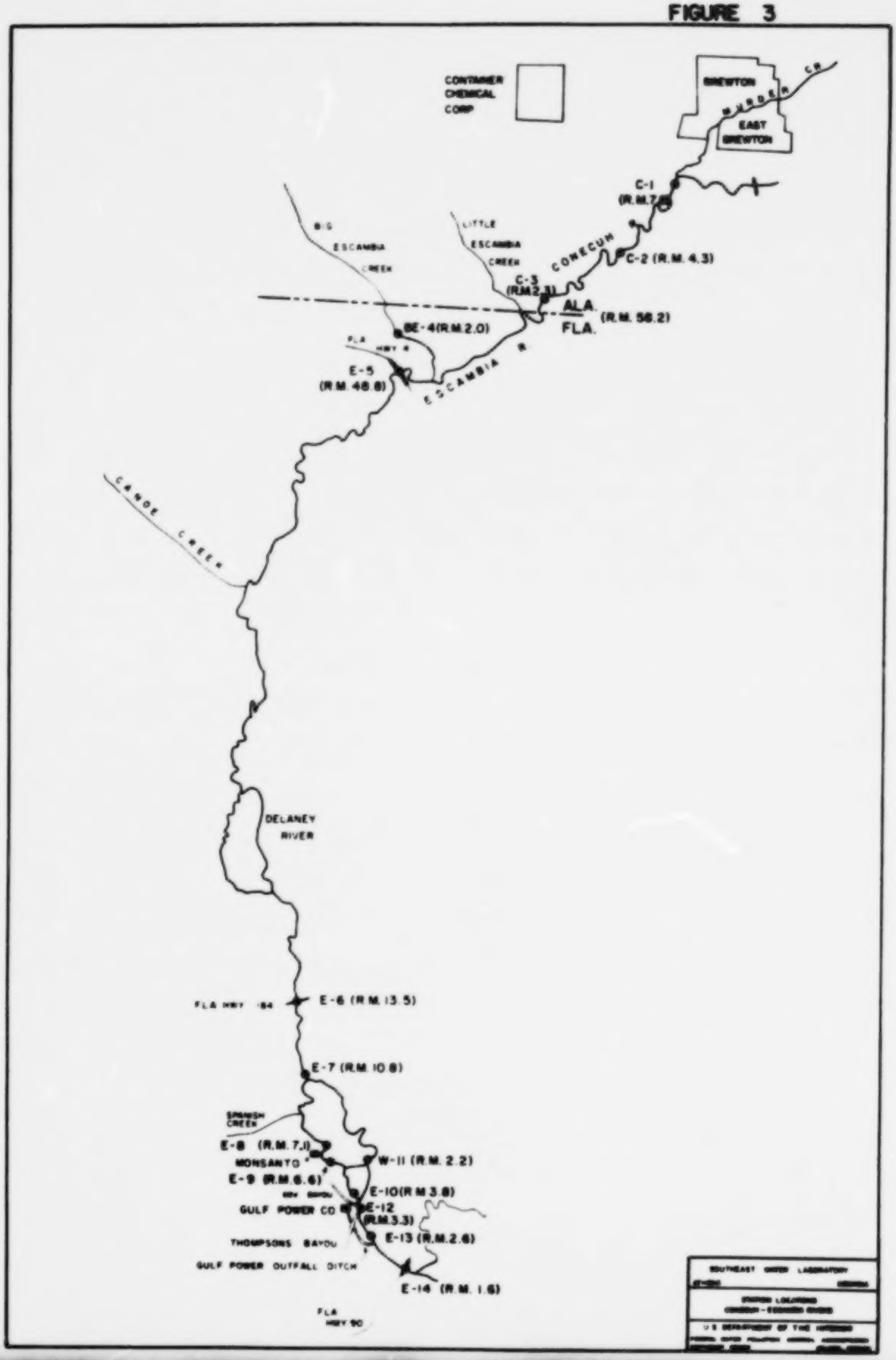
The drainage basin of the Escambia River contains 3817 square miles and based on a 30-year period of record near Century, Florida, has an average annual flow of 6100 cubic feet per second (cfs) and a maximum and minimum flow of 77,200 cfs and 596 cfs, respectively. Based on a period of record from 1935 to 1965, the seven-day minimum flow with a recurrence interval of ten years is 785 cfs.

During the past 12 years (1957-1968), the yearly mean flow at Century has varied from a high of 8435 cfs in 1960 to a low of 2,889 in 1958 (Figure 4). Record low flows occurred in 1968 including a seven-day low flow of 614 cfs occurring in September.

The average daily flows occurring during the period of the Escambia River study were as follows:

October 20, 1969 - 1620 cfs
October 21, 1969 - No data
October 22, 1969 - 1770 cfs

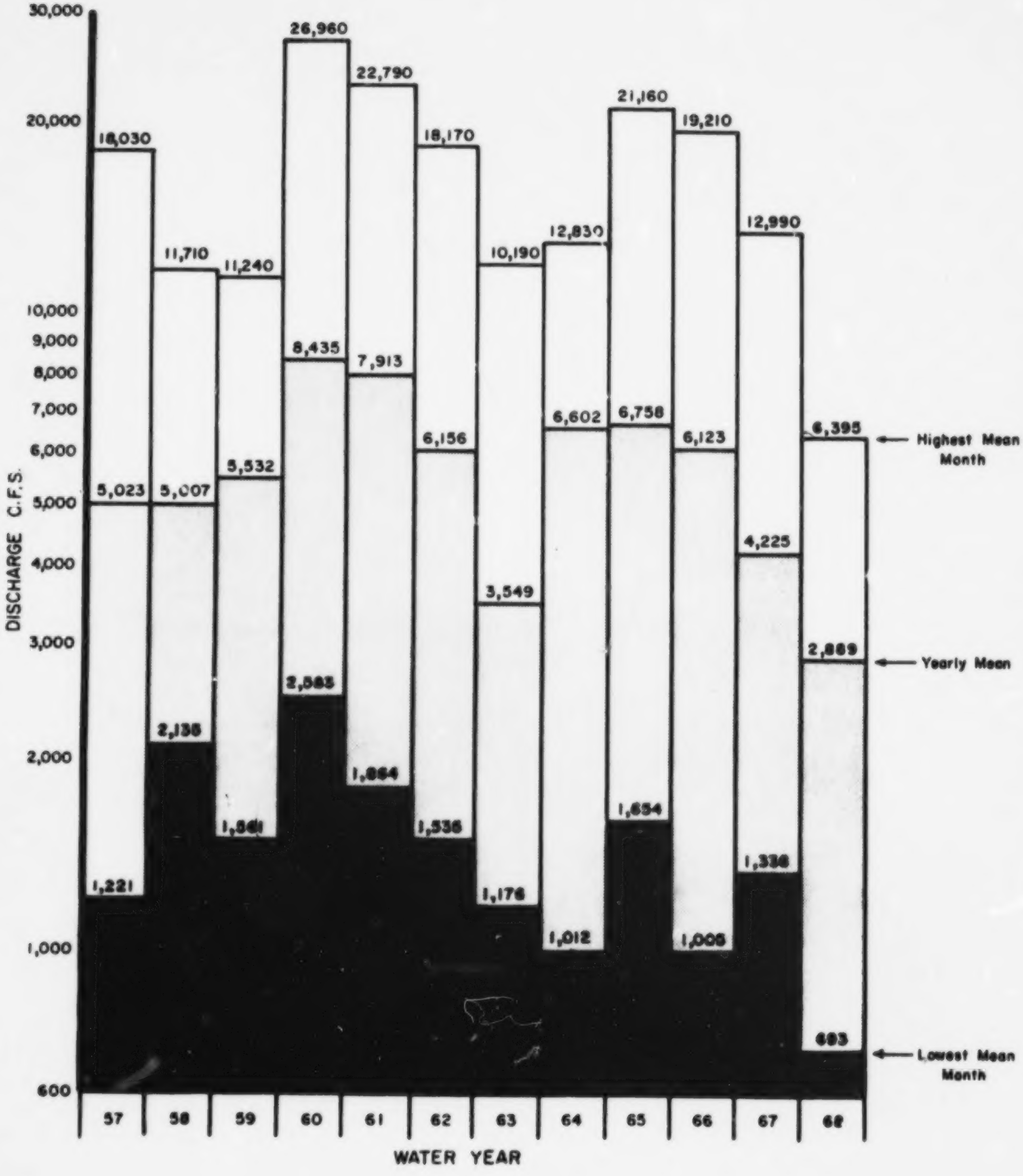
FIGURE 3


CONTAINER CHEMICAL CORP
BREWTON
EAST BREWTON
MURDER CR
C-1 (R.M.7
C-2 (R.M. 4.3)
C-3 (R.M.2.3)
CONECUH
LITTLE ESCAMBIA CREEK
BIG ESCAMBIA CREEK
ALA.
FLA.
(R.M. 56.2)
BE-4 (R.M.2.0)
FLA HWY 4
E-5 (R.M. 48.8)
ESCAMBIA R
CANOE CREEK
DELANEY RIVER
FLA HWY 184
E-6 (R.M. 13.5)
E-7 (R.M. 10.8)
SPANISH CREEK
E-8 (R.M. 7.1)
MONSANTO
E-9 (R.M.6.6)
W-11 (R.M. 2.2)
E-10 (R.M 3.8)
GULF POWER CO
E-12 (R.M.3.3)
THOMPSONS BAYOU
E-13 (R.M.2.6)
GULF POWER OUTFALL DITCH
E-14 (R.M. 1.6)
FLA HWY 90
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA
STATION LOCATIONS
CONECUH - ESCAMBIA RIVERS
U S DEPARTMENT OF THE INTERIOR

13-A

FIGURE 4

ESCAMBIA RIVER NEAR CENTURY, FLORIDA



October 23, 1969 - 1510 cfs

October 24, 1969 - 1510 cfs

October 25, 1969 - 1510 cfs

October 26, 1969 - 1510 cfs

October 27, 1969 - 1400 cfs

October 28, 1969 - 1350 cfs

During late September 1969, prior to this study, heavy rains in the upper portion of the basin caused flooding conditions at Century. Flows increased from 914 cfs on September 19th to a flood crest of 11,600 cfs on September 24, 1969. In the reach of river from Century bridge upstream this flood scoured the bottom, resorted the sand and gravel substrate and had an unknown but undoubtedly drastic effect on the invertebrate fauna.

The Escambia River is characterized by an upper reach from Brewton, Alabama, to Molino, Florida, having moderate gradient (five feet per mile) and a lower section from Molino to the bay having negligible gradient (less than one foot per mile). The upper region of moderate gradient is characterized by swift current with steeply cut banks and a substrate changing from rocks and rubble in the upper reaches to sand and silt from the state line downstream.

From Molino downstream the current is sluggish and the river flows through low swampy areas with many sloughs and back waters. The substrate is soft and composed of a mixture of sand, silt and finely divided organic matter. Salt water penetration is dependent on river flow and during periods of low flow reportedly (3) may extend upstream a distance of approximately 8 miles from the mouth of the river (designating buoy #20 as mile zero).

Data on vertical profiles of salinity were collected from above the Monsanto Chemical Company outfall downstream to Highway 90 bridge between 12:00 noon and 1:00 pm on October 28, 1969 during a period of high slack tide. On October 28, the most upstream intrusion of salt was detected near the bottom of the river approximately 200 yards above the Monsanto barge dock at river mile 7.0 (Table 1, Figure 5). The salt water wedge, which terminated at river mile 7.0, exhibited salinities of 21.0 parts per thousand (°/oo near the bottom decreasing to 1.0 °/oo near the surface. From river mile 6.6 downstream to the Gulf Power effluent ditch (river mile 2.7) salinity in the upper 2 to 5 feet ranged from 1.0 to 3.0 °/oo (Figure 5). In this reach of river a sharp increase in the vertical salinity gradient occurred below a depth of seven feet terminating in a maximum salinity of approximately 21.0 °/oo. As would be expected, the wedge of increasing salinity was nearer the surface at downstream stations.

TABLE 1

SALINITY (°/oo) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	200 Yards Above Monsanto Barge Landing R.M. 7.1	100 Yards Above Monsanto Barge Landing R.M. 7.1	1st Monsanto Outfall Pipe	Just Above Gas Line Crossing	Just Above White River Confluence
	MID	MID	MID	MID	MID
Surface	00.33	00.26	00.68	01.10	03.80
3'	00.33	00.26	00.77	01.46	04.02
6'	00.33	00.26	01.28	01.75	05.02
10'	00.33	00.26	19.48	21.16	20.06
13'	00.33	13.88	21.31	21.58	
16'		21.26		21.58	
19'		21.25			
22'		21.25			

TABLE 1 (Continued)

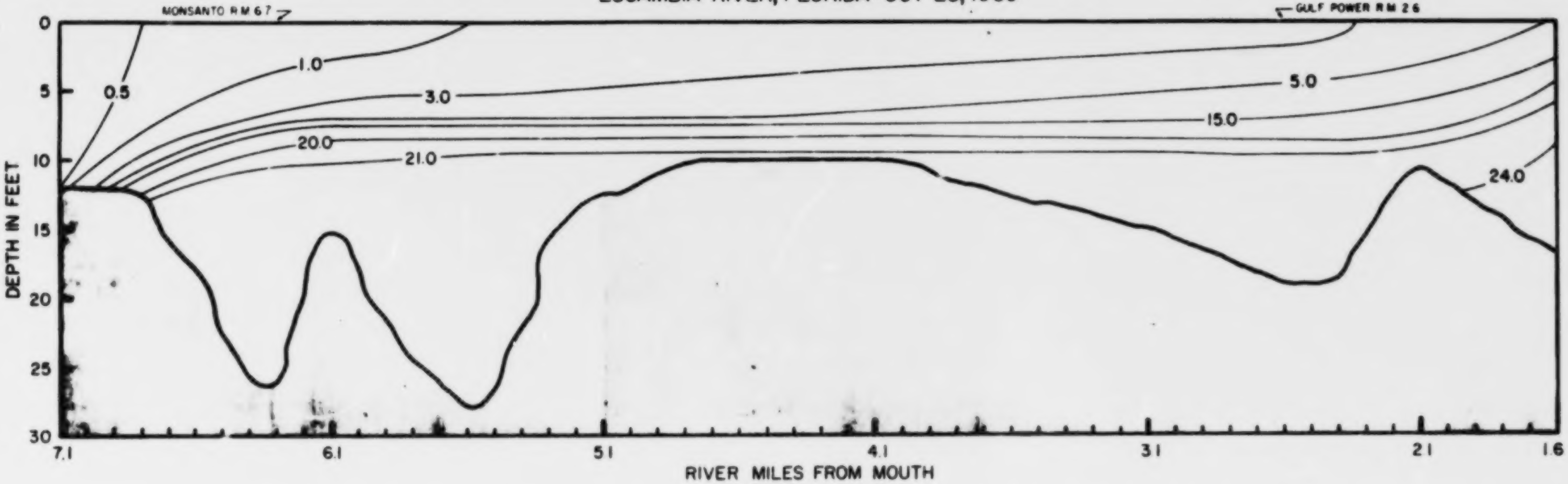
SALINITY ($^{o}/oo$) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	Just Below White River Confluence			200 Yds. Below Gulf Power Outfall Ditch	Mouth of Escambia River - Left Fork Bouy # 22A
	LB	MID	RB	MID	MID
Surface	3.32	2.42	2.88	03.47	05.00
3'	4.46	4.68	4.70	04.26	12.46
6'	5.38	5.32	5.40	17.00	21.14
10'		19.98	21.96	22.17	24.78
13'			21.96	22.38	
16'					
19'					
22'					

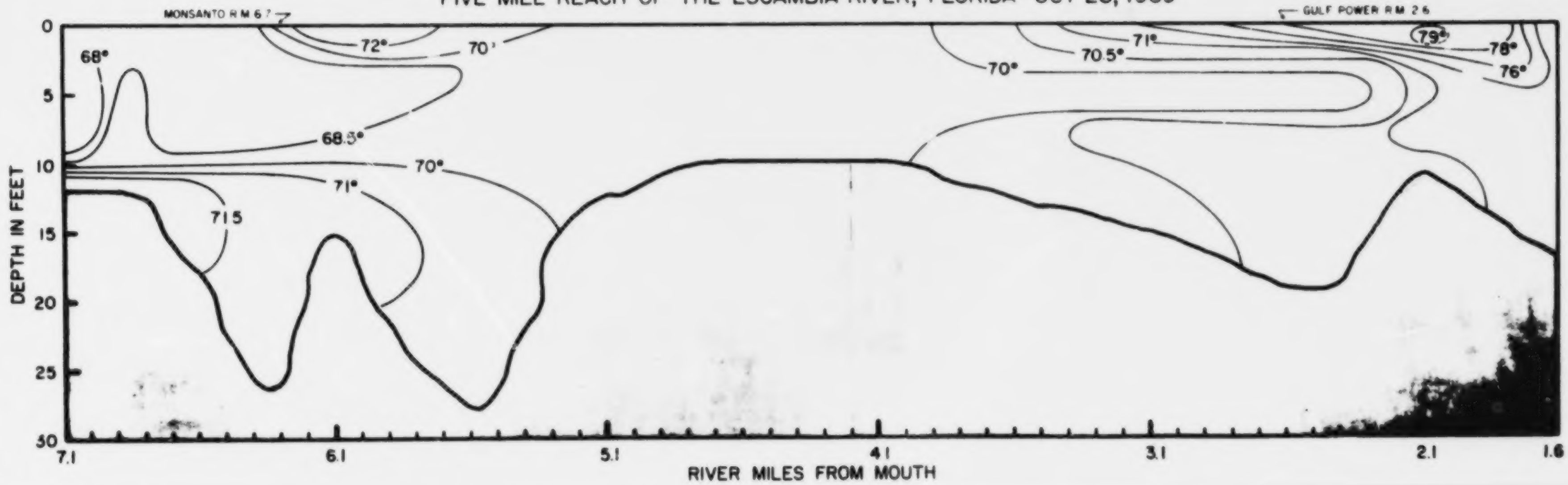
LEGEND: MID = Mid Channel
LB = Left Bank Looking Upstream
RB = Right Bank Looking Upstream

FIGURE 5

MID CHANNEL SALINITY (0/00) PROFILE ALONG A FIVE MILE STRETCH OF THE ESCAMBIA RIVER, FLORIDA-OCT 28, 1969



MID CHANNEL TEMPERATURE (°F) PROFILE SHOWING EFFECTS OF TWO HEATED EFFLUENTS ALONG A FIVE MILE REACH OF THE ESCAMBIA RIVER, FLORIDA - OCT 28, 1969



IV. WATER USE

A. ESCAMBIA BAY

Escambia Bay is a recreational as well as commercial center, utilized by fisherman, pleasure boaters and shellfish harvesters. Typical of most estuaries, it has provided a spawning ground and nursery for several species of aquatic life. The bay has also become an industrial center with extensive commercial water traffic in the channel. Wastes from municipal and industrial sources are discharged to Escambia River and Bay. Recreational and commercial fishing uses of the bay have declined in recent years.

Water Use Classification

All of Escambia Bay except the area east of the center of the bay and south of the L&N railroad bridge has been classified by the State of Florida as Class III; Recreation, Propagation and Management of Fish and Wildlife.

Requirements for this category are:

(1) Sewage and industrial wastes shall receive modern, effective treatment. This is interpreted by the State of Florida as requiring at least 90% removal of organic matter.

(2) Receiving waters shall not be caused to vary more than one unit on the pH scale from the normal background pH level. In no case will pH be less than 6.0 or greater than 8.5.

(3) Dissolved oxygen levels shall not be artificially depressed below 4.0 mg/l.

(4) Bacteria of the coliform group shall not exceed 1,000 per 100 ml as a monthly average (MPN or MF) nor exceed this value in more than 20% of the samples examined per month; nor shall it exceed 2400 per 100 ml on any day.

(5) No substances shall be present which are toxic or harmful to humans, animal or aquatic life.

(6) The water shall be free from materials attributable to municipal, industrial, agricultural and other discharges producing color, odor or other conditions in such degree as to create a nuisance.

(7) Turbidity shall not exceed 50 Jackson units above background.

(8) Temperature shall not be increased so as to cause damage to aquatic life or vegetation of the receiving waters or interfere with any beneficial use assigned to such waters.

The southeast portion of Escambia Bay below the L&N railroad bridge has been established as Class II; Shellfish Harvesting. The criteria for shellfish harvesting are similar to recreation values; the major difference being a more stringent bacteriological requirement. This criterion requires that the coliform group not exceed a median of 70/100 ml and should not exceed 230 per 100 mg/1 in more than 10% of the samples measured under the most unfavorable climate and hydrographic conditions.

Fishing and Recreation

Escambia Bay has been a prolific spawning ground for many species of fish, crab, shrimp and oyster. Among these, many species have important sport and commercial value including brown and white shrimp, mullet, menhaden, flounder, redfish, speckled trout and oysters. Numbers of white shrimp are markedly decreased in recent years. The disappearance of bottom grasses which offered a natural habitat for the shrimp has been theorized as the predominant cause of their declining numbers.[1] Sport fish, in general, appear to be present in fewer numbers in the bay in recent years.

At least 17 documented fish kills have occurred in the area over the past year.[2] Most of these kills occurred in Mulat-Mulatto Bayou. Several major kills also occurred in the northern section of Escambia Bay near the marsh flats.

A major fish kill in Mulat-Mulatto Bayou occurred in June 1969. FWPCA made an investigation of this particular kill at the request of the Governor of Florida. Results of the study showed that dissolved oxygen was greatly reduced in the bayou. It was concluded that the reduced dissolved oxygen and/or toxic material was responsible for the fish kill. The present study is the result of a recommendation, made in this report, for an extensive nutrient source survey in Escambia River and Bay (4). These conclusions and recommendations were presented to the Florida Department of Air and Water Pollution Control in July 1969.

There are at least four fish camp concessions on or near Escambia Bay (Lora Point, Mulat Bayou, Smith's Bayou and Escambia River). Three proprietors questioned are unanimous in their opinion that recreational use of Escambia Bay has been declining sharply in recent years. The proprietor of the most popular of the four establishments, Smith's Fish Camp, stated that he buys about $500 worth of live shrimp each year for use as bait for speckled trout, red fish and flounder. From five to seven years ago, he was purchasing $10,000 worth. His records for boat rentals show a similar decline over the same period.[3] The Florida Game and Freshwater Fish Commission has estimated a decrease in fishing value in Escambia Bay of 80% since 1952 (5).

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[1] Written communication, Lt. Lewis E. Zangas, Florida Department of Natural Resources

[2] Written communication, Dr. Thomas Hopkins, Univ. of West Florida

Fishing licenses issued in Escambia County have increased approximately in proportion to the increase in population over the past nine years (about 18%). The large number of popular boating and fishing areas near the Gulf of Mexico and the Intracoastal Waterway have reportedly become preferred alternatives to Escambia Bay.

Although quantitative information on contact sports such as swimming and water skiing was not generally available, there is at least one commercial bathing beach on Escambia Bay. This concession near Lora Point has a docking facility, picnic pavilion and sand beach. Attendance figures for this facility were not available. Numerous private dwellings along the shores of the bay have docks for private boats and expanding residential development on the east side of Escambia Bay emphasize easy access to water through finger fill canals behind each home.

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[3] Written communication, Outdoor Editor, Pensacola News Journal

Shellfishing

Lower Escambia Bay, south of the railroad bridge and east of the bay's center line, is an approved area for oyster harvesting. Most of the area has been leased by commercial firms for private harvesting.

The two major commercial fishing concerns in the Pensacola area, American Seafood Company and Joe Patti Seafood Company, report a significant reduction in shrimp production in Escambia Bay. Nearly all shrimp harvesting in the bay is performed by these two companies. American Seafood reports production has decreased by about 80% in the past five years. A comparison of production for the months of May through June show a reduction from 162,540 pounds of shrimp for 1968 to 30,380 pounds in 1969. They also noted a "considerable" reduction of speckled trout and flounder for the past four years. The Joe Patti firm reports a decline in shrimp production from Escambia Bay for the first eight months of 1969 from 490,000 pounds to 110,000 pounds as compared to a similar period of 1968. They also indicate that white shrimp have virtually disappeared from the region and that brown shrimp have shown a considerable decline in number.4/

Industry and Commerce

The Monsanto Corporation and Gulf Power Company located on the Escambia River utilize barges to bring raw materials and fuel to their plants. Escambia River and Bay are also utilized as sources of cooling water by several of the industries located in the area. Finally, the estuary also is used as a means of waste discharge and conveyance for domestic and industrial wastes.

4/ Written communication, Outdoor Editor, Pensacola News Journal

B. ESCAMBIA RIVER

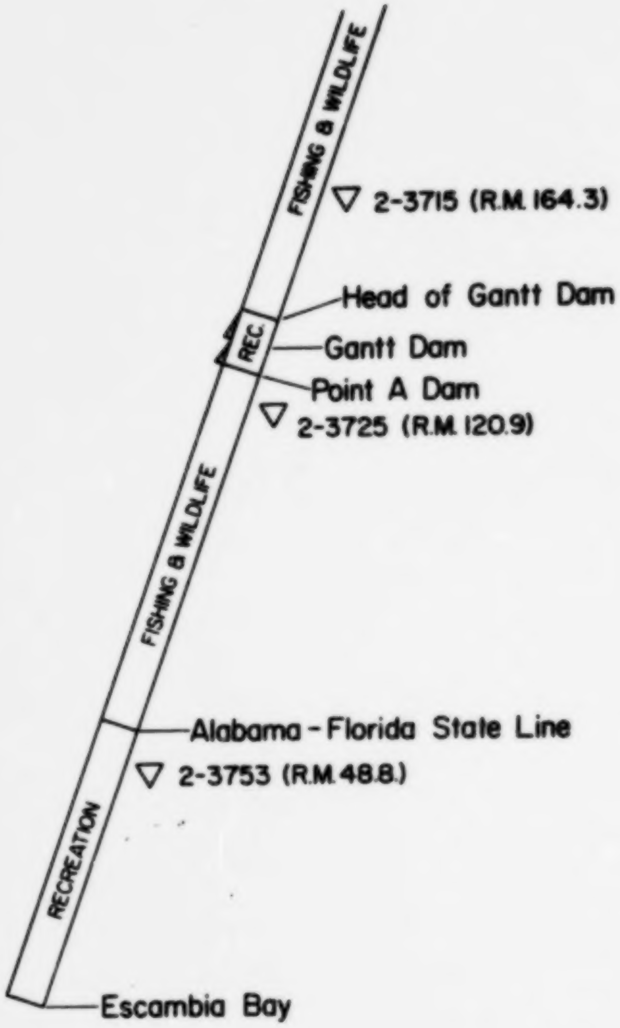
Water Use Classification

All of the Conecuh-Escambia River drainage is classified as Fish and Wildlife use in Alabama and Class III; Recreation, Fish and Wildlife in Florida (Figure 6).

Fishing and Recreation

The Conecuh-Escambia River in the area of the Alabama-Florida state line contains a very diversified fish population. In the lower region where the river is influenced by salt water from the bay, the population is less diversified. Among the fishes of importance to the sport and commercial fishermen are the largemouth and spotted bass, bluegill, crappie, warmouth, rock bass, white bass and channel catfish. The Florida Game and Freshwater Fish Commission in a comparison of fish collected with rotenone from the upper river in 1957 and 1967 reported a dramatic decrease in total numbers and total weight of fish over the ten-year period (6). During that period, there have been numerous fish kills reported, some of which have reached major proportions. Kills have been reported in both the upper and lower reaches of the river. During the past few years, the number of reported kills in the river has declined.

There are at least six commercial fish camps located along the river from Brewton, Alabama, to the mouth of the river. These camps sell bait and fishing gear, rent boats and provide access to the river. According to the Florida Game and Freshwater Fish Commission, 260 boats were licensed for hire in that area in 1962. In addition, on some weekends as many as 40-50 private boats are launched from each


FISHING & WILDLIFE
2-3715 (R.M. 164.3)
Head of Gantt Dam
REC.
Gantt Dam
Point A Dam
2-3725 (R.M. 120.9)
FISHING & WILDLIFE
Alabama - Florida State Line
2-3753 (R.M. 48.8.)
RECREATION
Escambia Bay

SCALE 1" = 10 MI.

CONECUH - ESCAMBIA RIVERS

camp each day. There are also several access sites along the river for which there are no records. In 1968-69 there were 101 boats launced from each site over the weekends. This is a reduction of some 60 per cent; however, there appears to be an increase in fisherman success in the past year according to personnel from the Florida Game and Fish Commission.

Industry and Commerce

The Conecuh-Escambia River from Brewton, Alabama, to Escambia Bay receives municipal wastes from Brewton, East Brewton and Flomaton in Alabama and Century in Florida. It receives industrial wastes from T. R. Miller Company, a lumber mill and wood preservative plant, Container Corporation of America, pulp and paper mill and drainage from the Pollard Oil Fields in Alabama. In Florida, the Monsanto Corporation and Gulf Power Company use the river for waste deposit and as a cooling water source. These two industries, also, use the river as a waterway for barging raw materials and fuel to their plants.

V. WASTE DISCHARGES

The major organic waste sources discharging to Escambia River and Bay are: Container Corporation of America at Brewton, Alabama; Monsanto Company; Escambia Chemical Company; American Cyanamid Company, and the Northeast sewage treatment plant of the City of Pensacola. In addition to these organic waste discharges, the Gulf Power Company and Monsanto Company release used cooling water to the lower reaches of the Escambia River at elevated temperatures. All of these sources except the Container Corporation are in the Pensacola metropolitan area.

Organic Wastes

The effects of organic waste effluents on quality of the receiving waters can be characterized by the carbon, nitrogen and phosphorus content. These three substances have both direct and indirect effects on the dissolved oxygen distribution. These interrelationships will be discussed more extensively in the water quality section of this report. A summary of data collected during the period September 10 to 20, 1969 is presented in Table 2.

Biochemical oxygen demand (BOD) is a measure of the quantity of oxygen that will be used in stabilizing the waste material in a stated period of time. The values presented are for a five-day period. Each pound of total organic carbon (TOC) discharged requires 2.67 pounds of oxygen from the receiving waters during stabilization to carbon dioxide. Total Kjeldahl nitrogen (TKN) is a measure of the

TABLE 2

SUMMARY OF WASTE DISCHARGES

Carbonaceous Material

Waste Source	Flow mgd***	Biochemical Oxygen Demand* Pounds/ Day	P.E.**	% Contribution	Total Organic Carbon Pounds/ Day	% Contribution	Theoretical Oxygen Demand Pounds/ Day	% Contribution
Container Corp.	36.0	7,420	44,530	32.7	10,410	52.5	30,380	28.5
American Cyanamid	4.5	4,450	26,710	19.6	5,230	26.3	32,950	31.0
Escambia Chemical	5.2	290	1,740	1.3	194	1.0	15,470	14.6
Monsanto Chemical								
Main Outfall	50.6	8,670	52,000	38.1	3,805	19.2	18,500	17.5
Condensate Ditch	1.9	1,430	8,600	6.3	95	0.5	450	0.4
Total		10,100	60,600	44.4	3,900	19.7	18,950	17.9
N.E. Pensacola STP	1.0	457	2,740	2.0	129	0.7	8,050	7.6
		22,720	136,320		19,865		106,070	

* All BOD values are five day
** One population equivalent = 0.17 pounds per capita per day
*** Million gallons per day

TABLE 2 CONT'D

SUMMARY OF WASTE DISCHARGES

Nitrogenous Material

Waste Source	Total Kjeldahl Nitrogen Pounds/ Day	Total Kjeldahl Nitrogen % Contri- bution	Ammonia Nitrogen Pounds/ Day	Ammonia Nitrogen % Contri- bution	Nitrite-Nitrate N Pounds/ Day	Nitrite-Nitrate N % Contri- bution	Total N P.E.*
Container Corp.	495	4.3	193	3.2	3.4	0.1	20,450
American Cyanamid	4,160	36.2	538	8.8	693	15.7	198,850
Escambia Co.	3,270	28.5	2,280	47.2	2,380	53.9	231,700
Monsanto Chem. Co.							
Main Outfall	1,830	15.9	1,071	17.5	1,290	29.3	127,800
Condensate Ditch	42	0.4	33	0.5	41	0.9	3,400
Total	1,872	16.3	1,104	18.0	1,331	30.2	131,200
N.E. Pensacola STP	1,684	14.7	1,393	22.8	3.5	0.1	69,200
	11,475		6,108		4,409		651,400

* One population equivalent = .024 pounds per capita per day

TABLE 2 CONT'D

SUMMARY OF WASTE DISCHARGES

Phosphorus Material

Waste Source	Total Phosphate* Pounds/ Day	Total Phosphate* P.E.**	Total Phosphate* % Contri- bution	Ortho-Phosphate* Pounds/ Day	Ortho-Phosphate* % Contri- bution
Container Corp.	150	18,300	13.6	73	9.6
American Cyanamid	3.0	370	0.3	2.0	0.3
Escambia Chemical Co.	320	39,040	28.8	314	41.3
Monsanto Chemical Co. Main Outfall	354	43,190	32.0	250	32.9
Condensate Ditch	67	8,170	6.1	14	1.8
Total	421	51,360	38.1	264	34.7
N.E. Pensacola STP	213	25,990	19.2	107	14.1
	1107	135,060		760	

*as phosphorus
**one population equivalent = .008 pounds per capita per day

total unsatisfied nitrogen as both nitrogen and ammonia. Each pound of this material reported as nitrogen requires 4.57 pounds of oxygen during stabilization to nitrates. The sum of these two values represents the theoretical amount of oxygen in the receiving water which is necessary to completely stabilize the unoxidized carbonaceous and nitrogenous content of the waste discharges. This is presented as the theoretical oxygen demand (TOD) by the relationship:

$$\text{TOD} = 2.67\,(\text{TOC}) + 4.57\,(\text{TKN}) \qquad (1)$$

where: TOD = theoretical oxygen demand

TOC = total organic carbon

TKN = total Kjeldahl nitrogen

This relationship is based on the assumption that all carbon will eventually be oxidized to carbon dioxide and all nitrogen will be oxidized to nitrate (7).

Phosphorus, as well as carbon and nitrogen, is a growth requirement for aquatic plants. Excessive phosphorus in the receiving water could stimulate both directly and indirectly excessive and undesirable populations of plankton and thereby upset the ecological balance among competing species. The ortho-phosphate form is that which is most readily acceptable for assimilation by plankton.

(A) Container Corporation of America

Container Corporation of America operates a bleached kraft pulp and paper mill at Brewton, Alabama. The plant discharges approximately 36 mgd of waste into a series of settling basins and natural ponds which provide about five days retention time before the effluent is discharged to Conecuh River about 50 miles upstream from the mouth of the Escambia River. In the settling ponds, pure oxygen is diffused into the waste. The average five-day BOD discharged to the Escambia River is 7,420 pounds per day, which is equivalent to the effluent produced by 44,530 people.[5] This accounted for 32.7% of the total BOD discharged. Container Corporation of America also discharged the largest quantity of TOC of any waste source in the study area; a mass of 10,410 pounds per day, which was 52.5% of the total.

This plant discharges 495 pounds per day of TKN, 193 pounds per day of ammonia nitrogen and 3.4 pounds per day of nitrite plus nitrate nitrogen, representing 4.3, 3.2 and 0.1%, respectively of these parameters. Although the total nitrogen discharge is small relative to other waste sources, it represents an equivalent population of 20,450.[6]

The waste loads of total and ortho-phosphates[7] are 150 and 73 pounds per day representing 13.6 and 9.6% of the total input, respectively. The total phosphorus discharge is equivalent to 18,300 PE.[8]

The TOD of this waste is 30,380 pounds per day or 28.5% of the total amount.

(B) Monsanto Company

Monsanto Company, a manufacturer of nylon fiber, injects 2.6 mgd of highly organic process and domestic waste into two deep strata wells, and discharges an average of 52.5 mgd of cooling water, boiler condensate and waste from their water treatment plant to the Escambia

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[5] 1 BOD_5 population equivalent = 0.17 pounds per day.

[6] 1 total nitrogen population equivalent = 9 pounds/year.

[7] All phosphates reported as Phosphorus (P).

[8] 1 total phosphorus population equivalent = 3 pounds/year.

River, about seven miles above the mouth. Two outfalls were monitored during the survey; the main outfall which was reportedly discharging cooling water, and the boiler condensate ditch. Data collected from these outfalls indicate that a highly significant quantity of process waste is being discharged with the cooling water and boiler condensate effluents.

The five-day BOD discharged from the plant is 10,100 pounds per day or 60,600 PE; which, at 44.4% of the total, is the largest waste source. The amount of TOC in the effluent is 3,900 pounds per day and 19.7% of the total contribution.

The quantity of TKN discharged by Monsanto is 1,875 pounds per day representing 16.3% of the total contribution. The total nitrogen population equivalent of this discharge is 131,200. The mass of ammonia nitrogen and nitrate plus nitrite nitrogen discharged are 1,104 pounds per day and 1,331 pounds per day, which were 18.0% and 30.2% of the total waste contribution in the study area.

Monsanto is also the most significant source of total phosphate contributing 38.1% of the total. The total phosphate discharged is 421 pounds per day or 51,360 PE. The contribution of ortho-phosphate is 264 pounds per day or 34.7% of the total.

The TOD of this discharge was 18,950 pounds per day, or 17.9% of the total.

(C) Escambia Chemical Company

Escambia Chemical is located on the northeastern shore of Escambia Bay, near Floridatown, Florida. Fertilizer, alcohol, ammonia and polyvinyl chloride are manufactured at this plant, which discharges about 5.2 mgd of waste through a swampy area. The retention time is estimated at two days. This source accounts for about one percent of both the five-day BOD and TOC discharged to the study area. However, it is the most significant source of nitrogen, contributing 47.2% of the ammonia nitrogen, 53.9% of the nitrite plus nitrate nitrogen and 28.5% of the TKN. Escambia Chemical Company discharges 2,380 pounds per day of nitrite plus nitrate nitrogen; more than all other sources combined. The quantity of TKN discharged is 3,270 pounds per day. The total nitrogen population equivalent of 231,700 is the largest quantity discharged to the study area, amounting to 35.6% of all sources.

A discharge of 320 pounds per day of total phosphate, or 39,040 PE, from Escambia Chemical accounted for 28.8% of the total. Orthophosphate, the most readily available form for algal assimilation, amounted to 310 pounds per day discharged, which is 41.3% of the total contribution, thus making Escambia Chemical Company the largest source of ortho-phosphate.

The TOD of the waste effluent from Escambia Chemical Company is 15,470 pounds per day, amounting to 14.6% of all discharges.

(D) American Cyanamid Company

American Cyanamid manufactures synthetic fibers at a plant located on the eastern shore of Escambia Bay just north of Mulatto Bayou. It discharges approximately 4.5 mgd of industrial and domestic waste, after primary treatment, to the bay through a 1,200 foot submerged outfall.

This waste source accounts for 19.6% of the five-day BOD and 26.3% of the TOC discharged. The five-day BOD discharged is 4,450 pounds per day or 26,710 PE. TOC discharged is 5,230 pounds per day.

American Cyanamid discharges 4,160 pounds per day of TKN or 36.2% of the total contribution, primarily in the form of organic nitrogen. American Cyanamid is the largest source of unstabilized organic nitrogen. The total nitrogen PE of this waste is 198,850, which is second only to that discharged by Escambia Chemical Company. About 8.8% of the ammonia nitrogen and 15.7% of the nitrite-nitrate nitrogen are discharged by American Cyanamid.

Phosphate discharged by American Cyanamid is negligible, amounting to only 0.3% of the total.

American Cyanamid discharges 32,950 pounds per day TOD. This is the largest single source of oxygen demanding material amounting to 31% of the total.

(E) Pensacola Northeast Sewage Treatment Plant

The Northeast sewage treatment plant is operated by the City of Pensacola and is the only waste source discharging principally domestic waste. This trickling filter plant is located on the western shore of Escambia Bay approximately two miles south of the I-10 bridge, where it discharges approximately one mgd of chlorinated secondary effluent through a submerged outfall. Immediately before the survey, wastes from Westinghouse and Ellyson Field Naval Air Station were intercepted and diverted to the Northeast sewage treatment plant. Construction to divert wastes from the Evergreen subdivision to this plant was in the last stages of completion at the time of the survey.

Carbonaceous waste discharged from this plant is insignificant compared to other waste sources amounting to no more than 2% of the total. The TKN and ammonia nitrogen discharges are 1,684 and 1,393 pounds per day, respectively. The population equivalent of the total nitrogen is 69,200 amounting to 14.7% of the TKN and 22.8% of ammonia nitrogen discharged from all sources. The quantity of nitrite plus nitrate nitrogen in the effluent is negligible.

The Northeast sewage treatment plant discharges 213 pounds per day or 25,990 PE of total phosphate and 107 pounds per day of orthophosphate. These values represent 19.2% and 14.1%, respectively, of the total contribution.

The effluent has the lowest TOD of 8,050 pounds per day, but still accounts for 7.6% of the total.

(F) Century, Florida

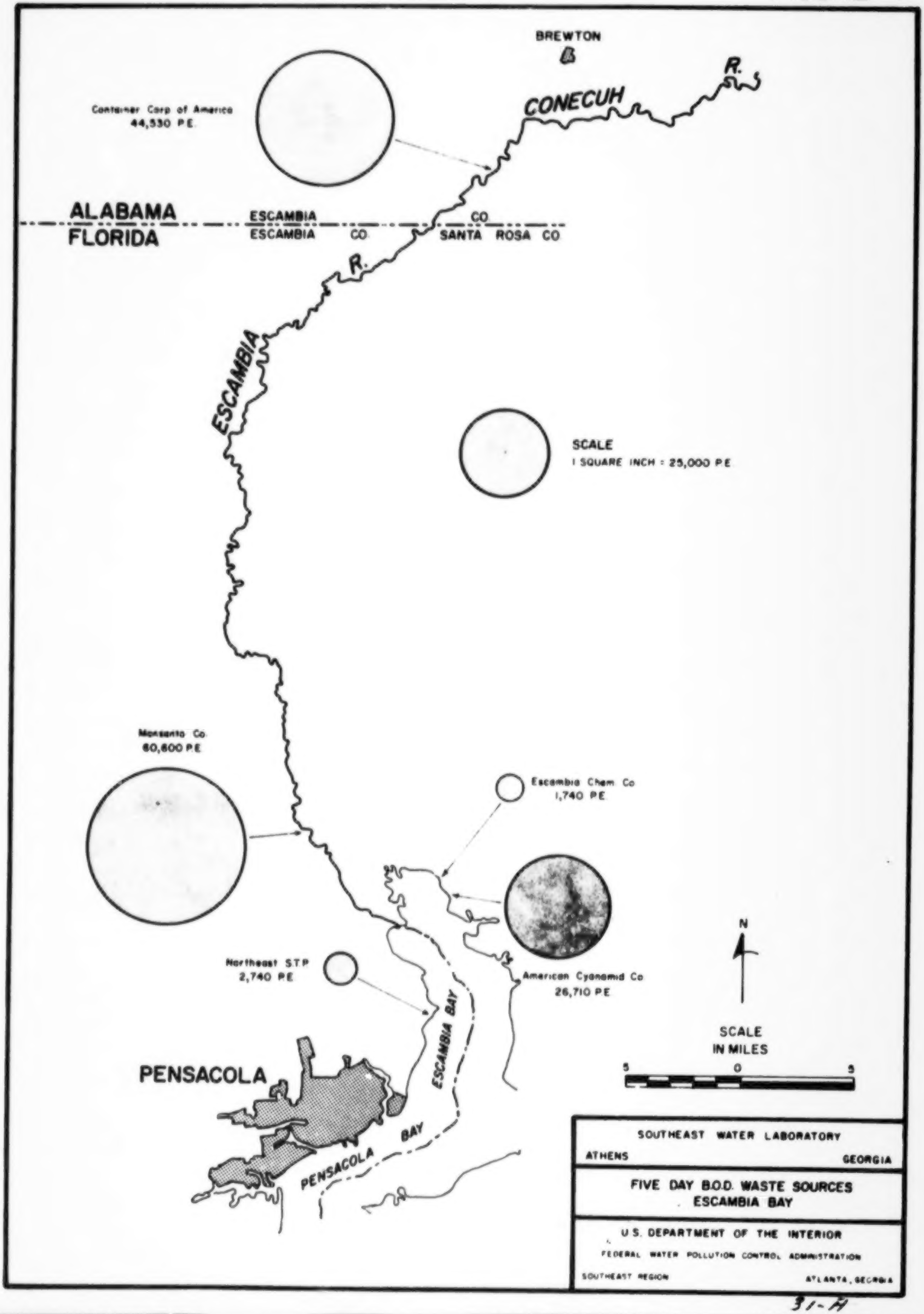
The community of Century, Florida, just south of the Alabama-Florida state line discharges untreated wastes from 50 to 60 homes, a sawmill and a small hospital. The effluent is to the swampy flood plain through which it flows approximately two miles to the Escambia River.

The total population equivalent of five-day BOD discharged to the study area is 136,320. The Monsanto Company discharges the largest mass of five-day BOD with Container Corporation of America and American Cyanamid also contributing significant quantities. These three sources account for 97% of the total. The total nitrogen discharged was equivalent to that produced by 651,400 persons. This is a massively excessive total compared to the domestic population. It is a significant cause of the water quality degradation of Escambia Bay by nutrient material. The most significant sources are Escambia Chemical discharging the largest quantity and American Cyanamid discharging slightly less. These two sources collectively discharge 430,550 PE or more than 66% of the total. When Monsanto's contribution of 131,200 is added, more than 86% of the total nitrogen is accounted. The total phosphorus population equivalent discharged was 135,060. All industries except American Cyanamid contributed significant amounts. Escambia Chemical and Monsanto collectively discharge 67% of the total. The relative waste discharges are illustrated in Figures 7, 8 and 9.

Of the 7,420 pounds per day of five-day BOD discharged by the Container Corporation of America at Brewton, Alabama, approximately 1,460 pounds per day of unstabilized material remain in the Escambia River when it becomes an estuary. With this reduction of organic materials in the river, above the bay, the Container Corporation contribution to the estuary is 8.9% of the total five-day BOD affecting water quality in Escambia Bay or 8,760 PE. The relative percent contribution of five-day BOD of Monsanto to the estuary is increased to 60.3% of the total, with the contribution of all other waste sources increasing slightly to compensate for the Container decrease. The five-day BOD contributions directly affecting water quality in the estuary are presented in Table 3. The total population equivalent of five-day BOD reaching the estuary from waste sources is 100,550.

The amount of nitrogenous waste discharged to the estuary is approximately the same as the total from all waste sources, since

FIGURE 7

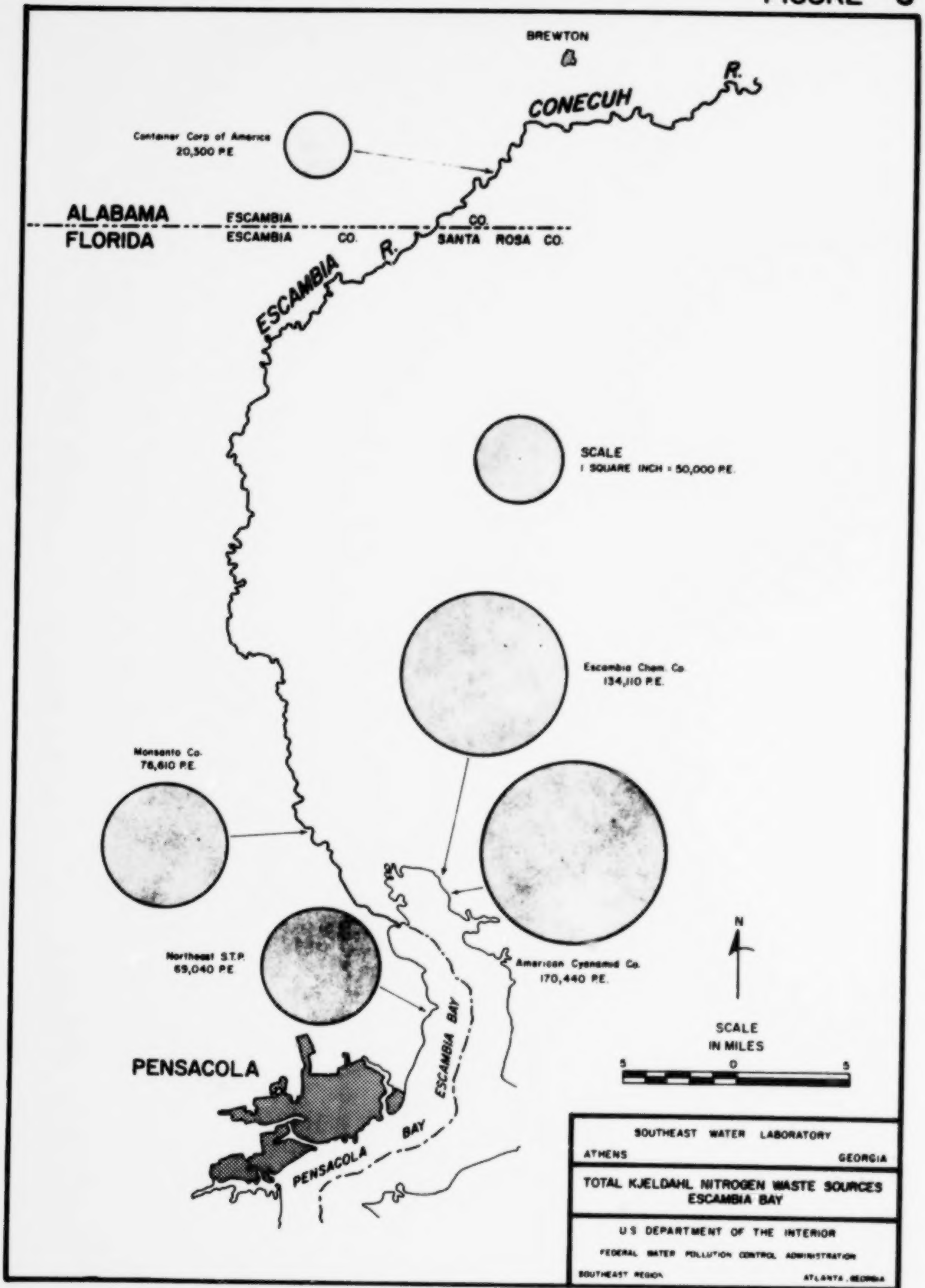

BREWTON
CONECUH
R.
Container Corp of America
44,530 P.E.
ALABAMA
FLORIDA
ESCAMBIA CO.
ESCAMBIA CO.
SANTA ROSA CO.
R.
ESCAMBIA
SCALE
1 SQUARE INCH = 25,000 P.E.
Monsanto Co.
60,600 P.E.
Escambia Chem. Co.
1,740 P.E.
American Cyanamid Co.
26,710 P.E.
Northeast S.T.P.
2,740 P.E.
N
ESCAMBIA BAY
PENSACOLA
PENSACOLA BAY
SCALE
IN MILES
5
0
5

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

FIVE DAY B.O.D. WASTE SOURCES
ESCAMBIA BAY

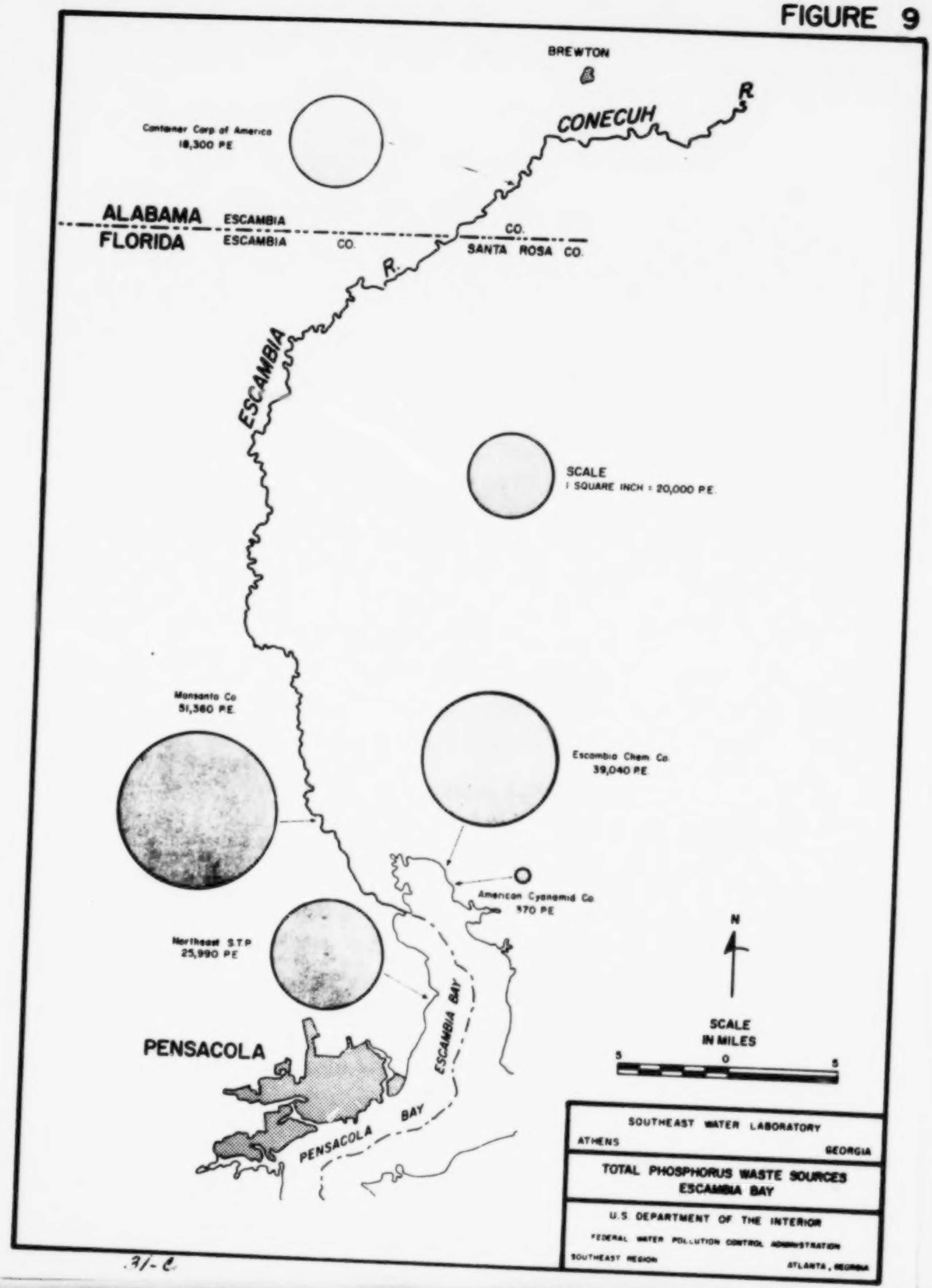
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 8


BREWTON
CONECUH R.
Container Corp of America
20,300 P.E.
ALABAMA
FLORIDA
ESCAMBIA CO.
ESCAMBIA CO.
SANTA ROSA CO.
ESCAMBIA R.
SCALE
1 SQUARE INCH = 50,000 P.E.
Escambia Chem. Co.
134,110 P.E.
Monsanto Co.
76,810 P.E.
Northeast S.T.P.
69,040 P.E.
American Cyanamid Co.
170,440 P.E.
N
SCALE
IN MILES
5
0
5
PENSACOLA
ESCAMBIA BAY
PENSACOLA BAY
SOUTHEAST WATER LABORATORY
ATHENS
GEORGIA
TOTAL KJELDAHL NITROGEN WASTE SOURCES
ESCAMBIA BAY
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION
ATLANTA, GEORGIA

31-B

FIGURE 9


BREWTON
CONECUH R
Container Corp of America
18,300 P.E.
ALABAMA
FLORIDA
ESCAMBIA CO.
ESCAMBIA CO.
SANTA ROSA CO.
ESCAMBIA R.
SCALE
1 SQUARE INCH = 20,000 P.E.
Monsanto Co
51,360 P.E.
Escambia Chem. Co.
39,040 P.E.
American Cyanamid Co.
370 P.E.
Northeast S.T.P.
25,990 P.E.
PENSACOLA
ESCAMBIA BAY
PENSACOLA BAY
N
SCALE
IN MILES
5
0
5

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

TOTAL PHOSPHORUS WASTE SOURCES
ESCAMBIA BAY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

.31-C

TABLE 3

WASTE SOURCE BOD_5 CONTRIBUTION TO THE ESCAMBIA ESTUARY

Waste Source	Pounds/ Day	Population Equivalents	Percent Contribution
Container Corp.	1,460	8,760	8.7
American Cyanamid	4,450	26,710	26.6
Escambia Chemical Co.	290	1,740	1.7
Monsanto Chemical Co.	10,100	60,600	60.3
Northeast sewage treatment plant	457	2,740	2.7
TOTAL	16,757	100,550	

Container Corporation's nitrogenous discharge is relatively insignificant compared to other waste sources.

Since only slight reduction in phosphates is expected to occur in the Escambia River from Brewton to the bay, the quantity of phosphorus discharged to the estuary would also be approximated by the total from all waste sources.

Toxic Wastes

Effluent samples were collected from the Monsanto Company, Escambia Chemical Company and the American Cyanamid Company for examination for suspected specific complex compounds which may be toxic to aquatic life. Gas chromatograph and mass spectroscopy analyses were made on each sample.

In the Monsanto effluent, no compounds were present greater than 5.0 milligram per liter (mg/l). Polychlorinated biphenyl compounds (PCB) were not detected at a sensitivity of 1 part per billion (ppb) in any of the three Monsanto samples. However, diphenyl oxide, known as phenyl ether, was present at an estimated concentration between 20 and 50 ppb in the sample collected from the north outfall. Diphenyl oxide is used as a heat transfer medium and may be implicated in odor problems from boiler blowdown. The toxicity of this substance to aquatic life has not been determined.

No compound in the Escambia Chemical effluent had concentrations greater than 5 mg/l. This sample was also analyzed for methanol which was not present at 1 mg/l. All other compounds analyzed have a 5 mg/l limit.

The American Cyanamid effluent sample contained acrylonitrile at a concentration of about 100 mg/l. Acrylonitrile is a monomer used in acrylic fiber. This compound is known to be highly toxic to rodents and has been used as a fumigant for insect control. Acrylonitrile has a higher lethal death capability than DDT for rats. Furthermore, acrylonitrile, unlike DDT, is moderately soluble in water. In fish toxicity studies, a concentration of 30 milligrams per liter (mg/l) caused 100% mortality to pin perch, a marine fish (8). Lesser concentrations resulted in lesser mortalities.

In addition to acrylonitrile, American Cyanamid also reportedly discharges 180 to 190 mg/l of sodium thiocyanate which is used as a solvent. Sodium thiocyanate is basically a very stable compound with high solubility. In the presence of chlorine, it breaks down to release cyanide, an extremely toxic substance to any aquatic life. However, such an occurrence would be highly unlikely unless one of the immediate waste sources discharges free chlorine.

Although it has not been directly demonstrated, the results of these analyses indicate that the wastes from American Cyanamid may be directly responsible for some of the fish kills in the northeast section of Escambia Bay. Consequently, it is recommended that the American Cyanamid Company immediately reduce concentrations of acrylonitrile in its waste effluent to levels less than 10% of that which is toxic to fish. Further investigations should be made to determine whether American Cyanamid or Escambia Chemical ever discharge free chlorine.

Thermal Pollution

Monsanto Company and Gulf Power Company at river mile 6.7 and 2.6, respectively, discharge large quantities of heated water after use for cooling purposes. The volume of Monsanto and Gulf Power discharges are approximately 50 million gallons per day (mgd) and 150 mgd, respectively.

To obtain an estimate of the effect of these discharges on the temperature regime of the lower portion of the river data on vertical and horizontal profiles of water temperature were collected from above the Monsanto Chemical Company outfall downstream to just below Highway 90 bridge (Table 4 and Figure 5).

The mean daily flow at Century on October 28 was 1350 cfs. Sampling was begun at the upper stations during high slack tide and by the time samples were collected at the lower stations there was a strong ebb tide running.

Surface waters immediately adjacent to the Monsanto outfall ditch were increased 19.5°F over the background temperature of the river immediately above the outfall. The heated effluent lies near the surface and water temperature returns to near ambient below a depth of six feet.

One hundred yards below the Monsanto outfall most of the heated water is near the surface on the left bank and has a maximum temperature of 81°F (Figure 10) and is 13°F over background. At a distance 300 yards below the outfall the heated effluent is well mixed horizontally with a surface temperature of 75°F (Figure 11). At this point the heated water is in the surface two feet of water.

TABLE 4

WATER TEMPERATURE (^{o}F) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	R.M. 7.1			200 Yards Above Monsanto Barge Landing			Adjacent To 1st Monsanto Outfall Pipe	Big Bend 100 Yards Below 2nd Outfall Pipe
	LB	MID	RB	LB	MID	RB	MID	MID
Surface	68.0	68.0	68.0	68.0	68.0	68.0	68.5	68.5
2'	68.0	68.0	68.0	68.0	68.0	68.0	68.75	68.5
4'	68.0	68.0	68.0	68.0	68.0	68.0	68.75	68.5
6'	68.0	68.0	68.0	68.0	68.0	68.0	68.75	68.5
8'	68.0	68.0	68.0	68.0	68.0	68.0	68.75	68.5
10'	68.0	68.0	68.0	68.0	68.0	68.0	68.75	71.0
12'	68.0	68.0	68.0	71.5		71.5	71.5	71.5
14'							71.5	71.5
16'								71.5
18'								71.5
20'								
22'								
24'								
26'								

LEGEND: LB = Left Bank Looking Upstream
MID = Mid Channel Looking Upstream
RB = Right Bank Looking Upstream

TABLE 4 (Continued)

WATER TEMPERATURE (°F) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	STATION 75 Yds. Above Main Outfall Ditch	10 Yds. Offshore at Monsanto Outfall Ditch R.M. 6.7	100 Yds. Below Monsanto Outfall Ditch			300 Yds. Below Monsanto Outfall Ditch		
	MID	MID	LB	MID	RB	LB	MID	RB
Surface	68.5	87.5	71.0	74.0	81.0	75.0	75.0	75.0
2'	68.5	76.5	70.0	70.0	75.0	71.0	71.0	71.5
4'	68.5	72.0	69.5	68.5	72.0	70.0	68.5	70.0
6'	68.5	68.5	69.0	68.5	69.0	69.0	68.5	70.0
8'	68.5	68.5	68.5	68.5	68.5	68.5	69.5	69.5
10'	71.0	68.5	71.0	71.0	71.0	71.0	71.0	71.0
12'	71.25	71.5	71.0	71.0	71.0		71.0	71.0
14'	71.25	71.5	71.0	71.0			71.0	71.0
16'	71.25	71.5	71.0	71.0			71.0	
18'	71.25	71.5	71.0	71.0			71.0	
20'	71.25	71.5	71.0	71.0				
22'			71.0					
24'			71.0					
26'			71.0					

TABLE 4 (Continued)

WATER TEMPERATURE (^{o}F) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	STATION 600 Yds. Below Monsanto Outfall Ditch at Gas Line Crossing	900 Yds. Below Monsanto Outfall Ditch	1200 Yds. Below Monsanto Outfall Ditch	1700 Yds. Below Monsanto Outfall Ditch
	MID	MID	MID	MID
Surface	73.5	73.0	70.5	70.0
2'	70.0	70.0	69.5	69.5
4'	68.5	68.5	69.5	69.5
6'	68.5	69.0	69.5	69.5
8'	68.5	69.0	69.5	69.5
10'	71.0	70.75	70.0	70.0
12'	71.0	70.5	70.0	70.0
14'	71.0	70.5	70.25	70.0
16'	71.0	70.5	70.5	70.0
18'	71.0	70.5	70.25	
20'	71.0	70.5	70.5	
22'	71.0	70.5	70.5	
24'			70.5	
26'			70.5	
28'			70.5	

TABLE 4 (Continued)

WATER TEMPERATURE (^{o}F) AT STATIONS ON THE ESCAMBIA RIVER - OCTOBER 28, 1969

DEPTH	STATION									
	R.M. 3.5 Just Below White River	100 Yds. Below Gulf Power Ditch			600 Yds. Below Gulf Power Ditch			100 Yds. Above Rt. 90 Hiway Bridge		
	MID	LB	MID	RB	LB	MID	RB	LB	MID	RB
Surface	70.25	82.5	78.0	70.25	81.0	78.0	71.5	77.5	72.0	72.5
2'	70.25	82.0	72.0	70.25	80.0	79.0	70.75	77.5	71.25	71.5
4'	70.0	82.0	70.0	70.25	75.0	70.5	70.25	78.0	76.00	71.5
6'	70.0	79.5	70.0	70.25	72.5	70.5	71.0	71.5	71.5	70.75
8'	70.5	71.0	70.75		70.5	70.75	70.5	71.0	71.5	70.75
10'	70.25	71.0	70.5			70.50	70.5		71.0	70.75
12'	70.25	70.5	70.5				70.5		71.0	71.0
14'	70.25	70.5	70.5						71.0	71.25
16'		70.5	70.5						71.0	
18'		70.5								
20'		70.5								
22'										
24'										
26'										
28'										

FIGURE 10

TEMPERATURE (°F) PROFILE 100 YDS. BELOW MONSANTO OUTFALL DITCH, R.M. 6.3
ESCAMBIA RIVER, FLORIDA - OCT 28, 1969

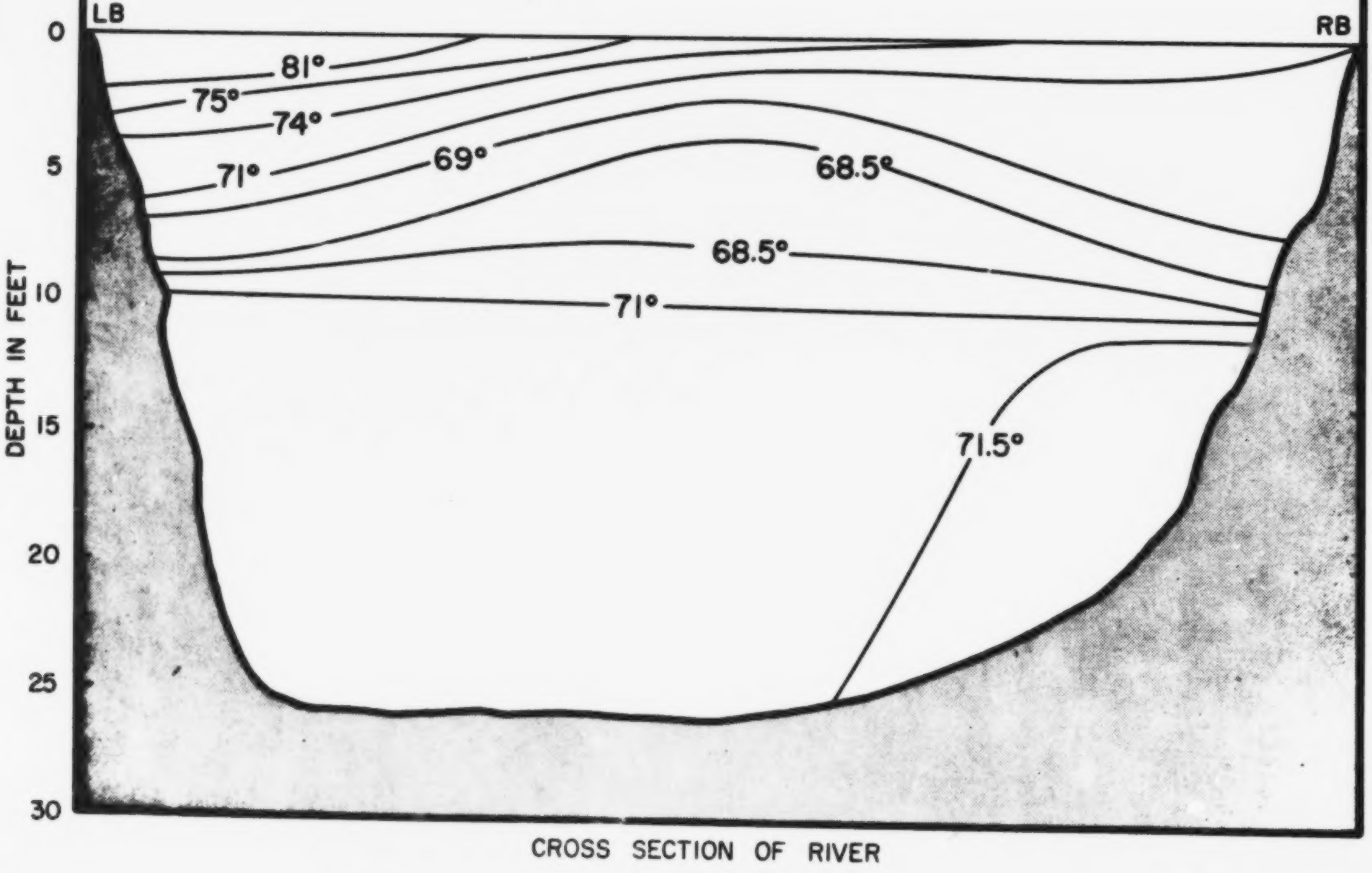
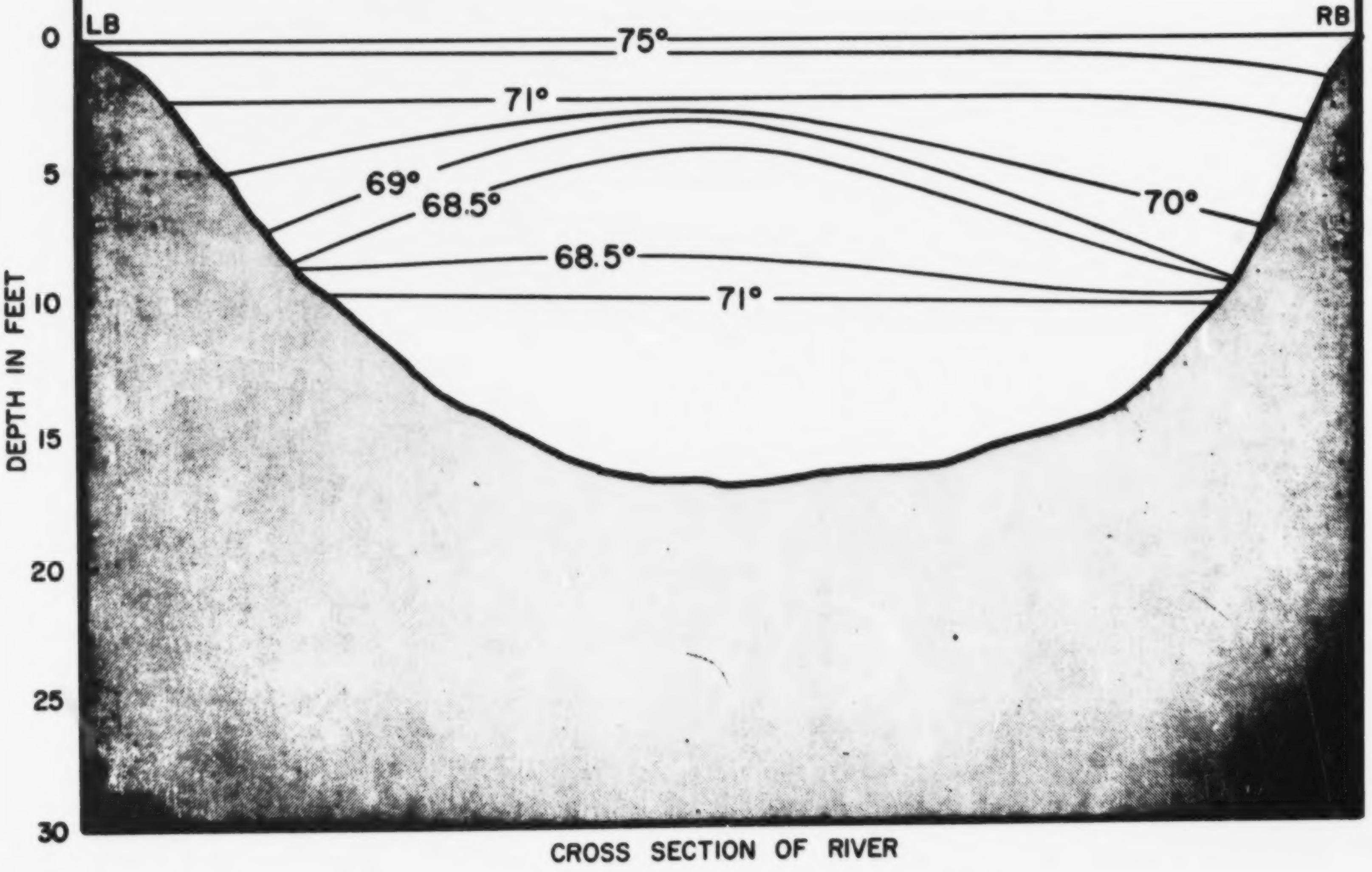


FIGURE 11

TEMPERATURE (°F) PROFILE 300 YDS. BELOW MONSANTO OUTFALL DITCH R.M. 6.1
ESCAMBIA RIVER, FLORIDA - OCT 28, 1969



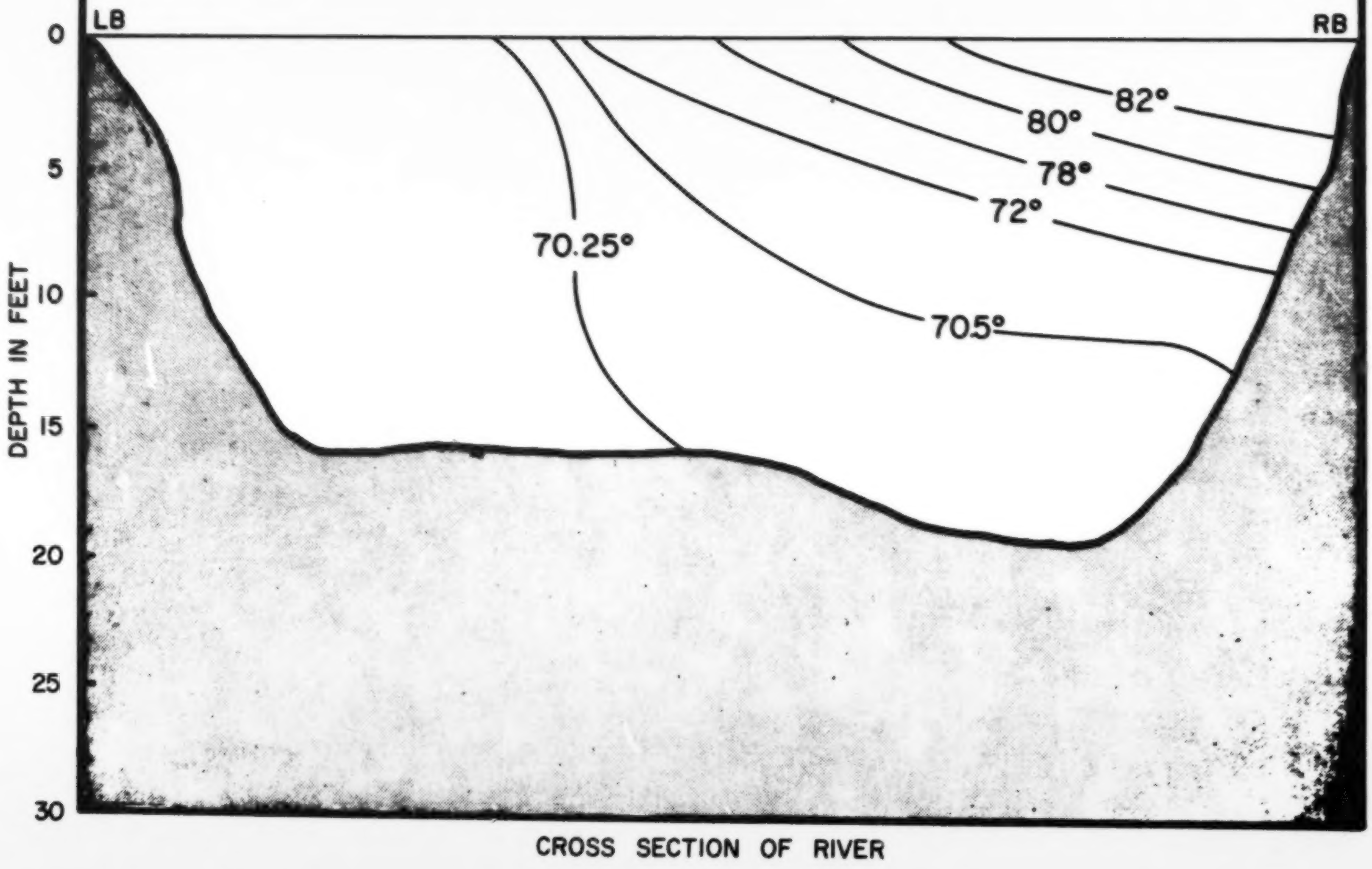
An unusual feature of the temperature regime in the upper section of river is the layer of warmer water near the bottom (Figure 5). Water near the bottom was found to be 3.0 to 3.5°F warmer than the surface water. On the basis of present data, it appears that this layer of warmer water coincides with the salt water wedge moving upstream from the bay. Solar heating of the quiescent bay waters combined with the heat added near the bay mouth by the effluent from Gulf Power would appear to be the most reasonable hypothesis to explain the elevated temperature of the saline wedge.

The Gulf Power effluent increases river temperature from 70.25°F to 82.5°F or 12.25° over background (Figure 12). This heated effluent clings to the left shoreline in the upper six feet of water and is still evident at Highway 90 bridge (1.0 mile below the effluent ditch) where the upper six feet of water along the right quarter of the river is still 7.25°F above temperatures of the river immediately above Gulf Power Company (Figure 13).

The effect of these elevated temperatures on biological life in the Escambia River has not been directly ascertained since there are other factors, such as discharge of organic wastes and physical variations in flow and natural sediment load, which could cause deleterious alterations in the biological community. The National Technical Advisory Committee to the Secretary of the Interior has recommended that water temperature in estuaries should not be increased more than 4°F from September to May nor more than 1.5°F during June through August (9). On this basis, both Monsanto Company and Gulf Power Company are discharging thermal pollution to the Escambia River and should abate this pollution.

FIGURE 12

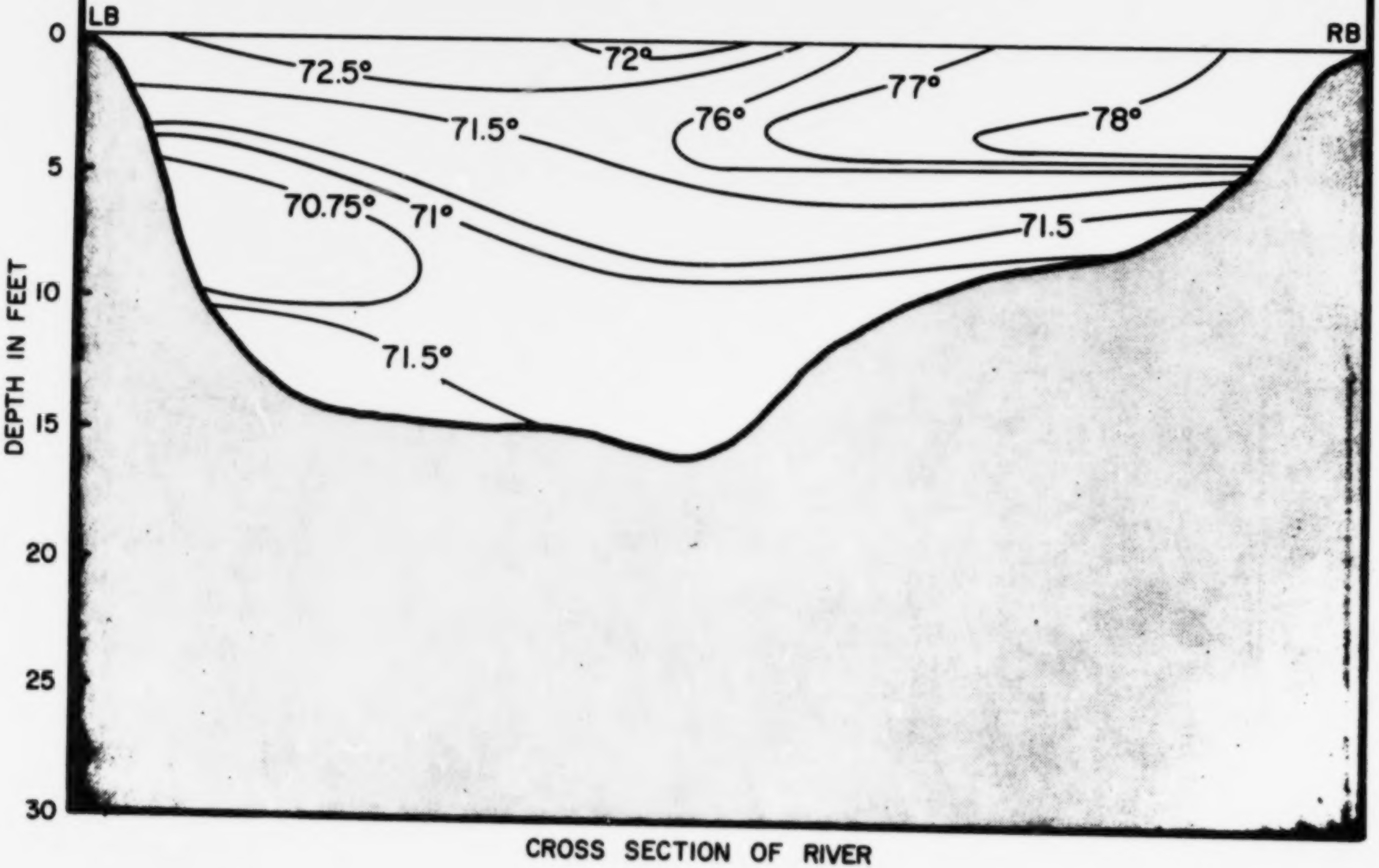
TEMPERATURE (°F) PROFILE 100 YDS. BELOW GULF POWER OUTFALL DITCH AT R.M. 2.6 ESCAMBIA RIVER, FLORIDA-OCT 28, 1969



34-A

FIGURE 13

TEMPERATURE (°F) PROFILE 100 YDS. ABOVE HIWAY 90 BRIDGE AT R.M.1.7 ESCAMBIA RIVER, FLORIDA - OCT 28, 1969



34-B

VI. WATER QUALITY

ESCAMBIA BAY

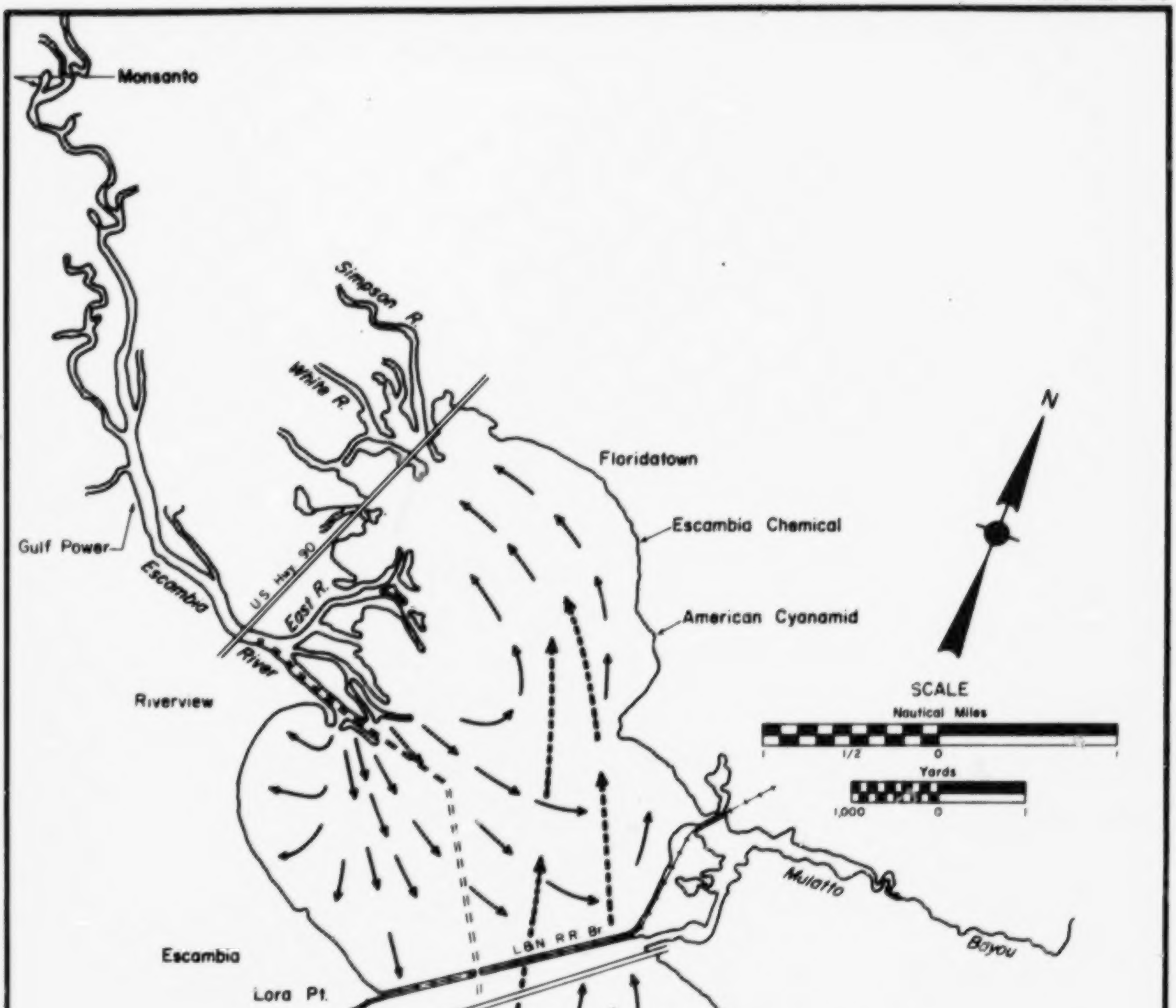
1) Current Movement

Since chlorides are inorganic and do not decay with time, examination of the chloride profiles in an estuary provides information on water movement and waste distribution. The only factors which could cause variations in chloride concentration at a particular point, are turbulent dispersion due to the tidal currents and advection caused by fresh water inflow, principally from the Escambia River. The volume of this fresh water inflow as well as the physical configuration of the bay also determine the amount of time it takes to flush wastes from Escambia Bay.

Figures 14 and 15 show the predominant current patterns in Escambia Bay derived from chloride analyses at 28 locations, collected ten times at each location synoptically, during the period September 23 through 25, 1969.

On the flooding current, fresh water discharge from the Escambia River disperses over the surface of the bay in the general direction of the eastern shore north of the L & N railroad bridge. More saline water from Pensacola Bay moves northward on the bottom along the eastern shore and prevents the fresh water from being flushed. Water in the bay below the railroad bridge moves in a northeast direction toward Mulatto Bayou and the water on the eastern shore above the bridge and adjacent to American Cyanamid and Escambia Chemical, is pushed into the relatively stagnant marshy

FIGURE 14

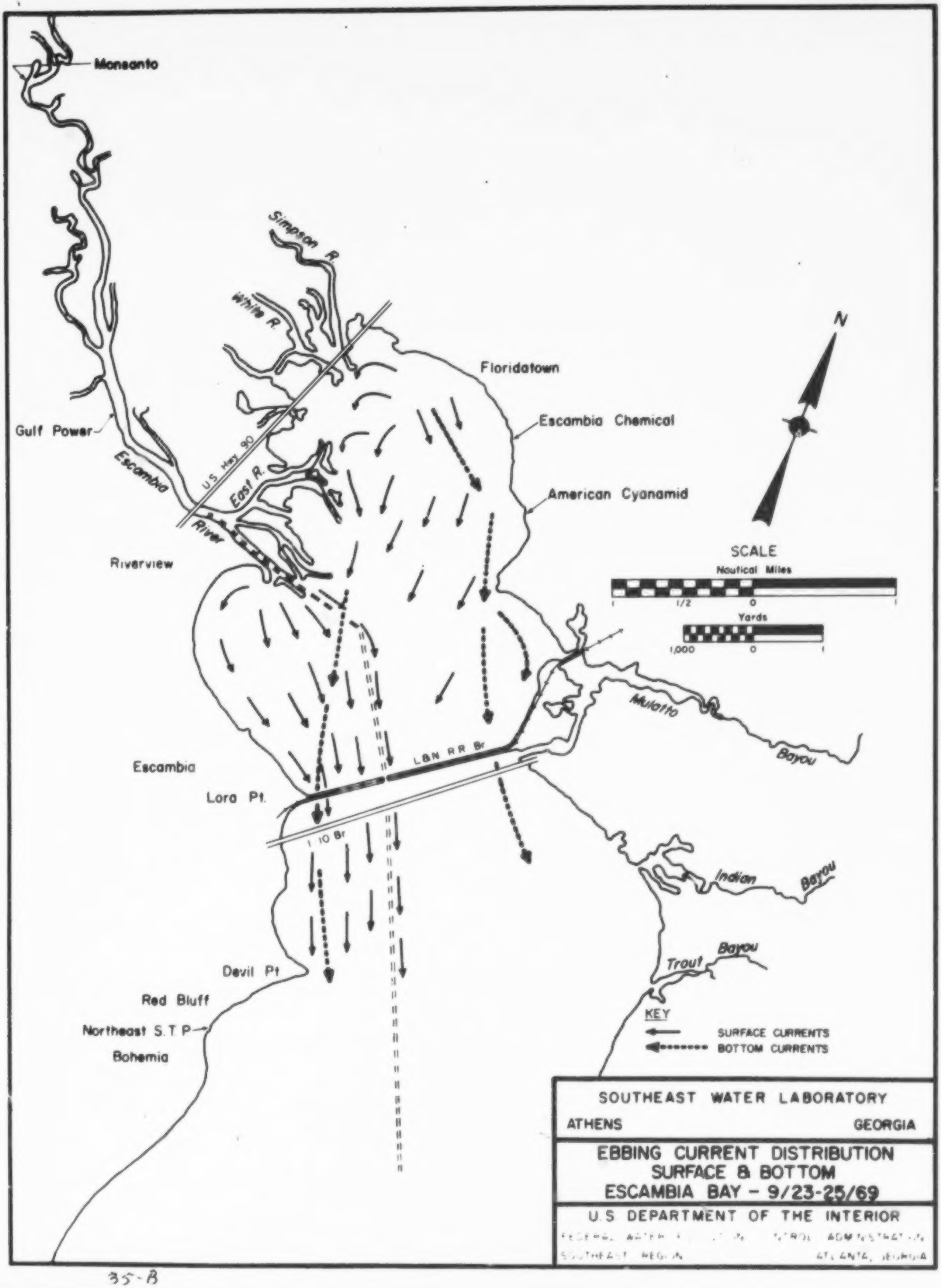

Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
Gulf Power
U.S. Hwy 90
Escambia
River
East R.
American Cyanamid
N
SCALE
Nautical Miles
1
1/2
0
1
Yards
1,000
0
1
Riverview
Mulatto
Bayou
L&N RR Br
Escambia
Lora Pt.
I 10 Br
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
KEY
SURFACE CURRENT
BOTTOM CURRENTS

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

FLOODING CURRENT DISTRIBUTION
SURFACE & BOTTOM
ESCAMBIA BAY - 9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 15


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
Gulf Power
U.S. Hwy. 90
East R.
Escambia
River
American Cyanamid
Riverview
N
SCALE
Nautical Miles
1
1/2
0
1
Yards
1,000
0
1
Mulatto
Bayou
L&N RR Br.
Escambia
Lora Pt.
I 10 Br.
Indian
Bayou
Trout
Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
KEY
SURFACE CURRENTS
BOTTOM CURRENTS

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

EBBING CURRENT DISTRIBUTION
SURFACE & BOTTOM
ESCAMBIA BAY - 9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

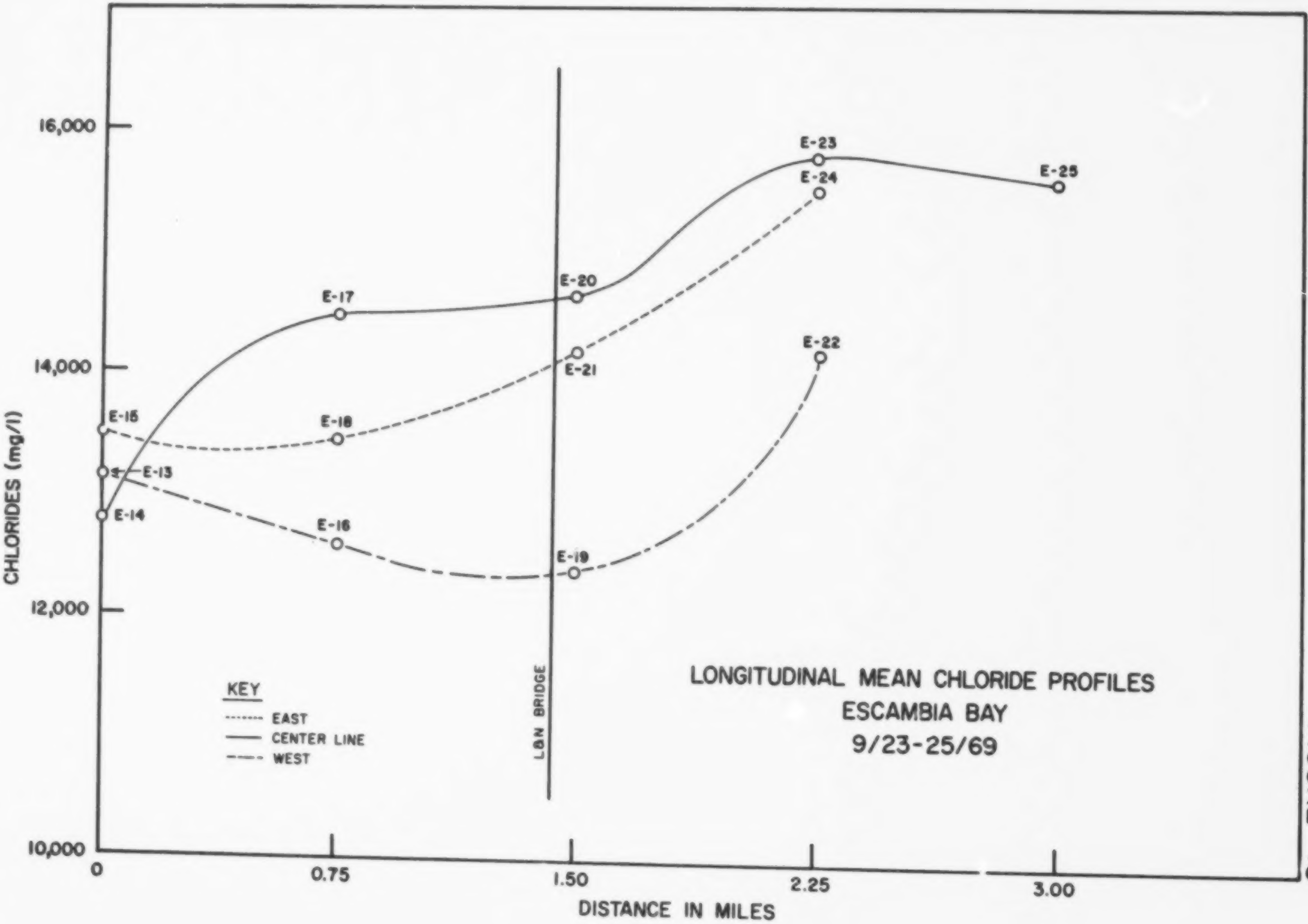
wetlands that characterize the northern part of the bay in the vicinity of the U. S. 90 bridge. This area shows little variation with tidal current indicating very poor circulation. Several fish kills have occurred in this area.

On the ebbing current, fresh water discharge from the Escambia River undergoes very little dispersion and flows south in a narrow zone on the surface, generally to the west of the center line of the bay. The more saline water recedes along the bottom of the bay primarily along the eastern shore. This impedes the flow of surface waters on the eastern shore which move in a southwesterly direction to the center and western portion of the bay.

In summary, the net outflow of water from the bay is along the western portion with intrusion of saline water on the eastern side, generally producing a counterclockwise circulation pattern. There is an area of very little flushing in the northern marsh flats above the mouth of the Escambia River.

At the point where the L & N railroad bridge crosses the bay, there is a decrease in chloride concentrations on the northwest side. This is illustrated in Figure 16. This indicates that fresh water is being held in the area just north of the bridge and is not able to discharge and disperse at a constant rate out of the bay. Escambia Bay at this location narrows to about two miles across. The area under the railroad trestle is congested due to closely spaced supporting piles, in some cases no more than three or four feet on center. These pilings occupy a significant percentage of the total cross sectional area under the trestle and reduce the volume available

FIGURE 16



LONGITUDINAL MEAN CHLORIDE PROFILES
ESCAMBIA BAY
9/23-25/69

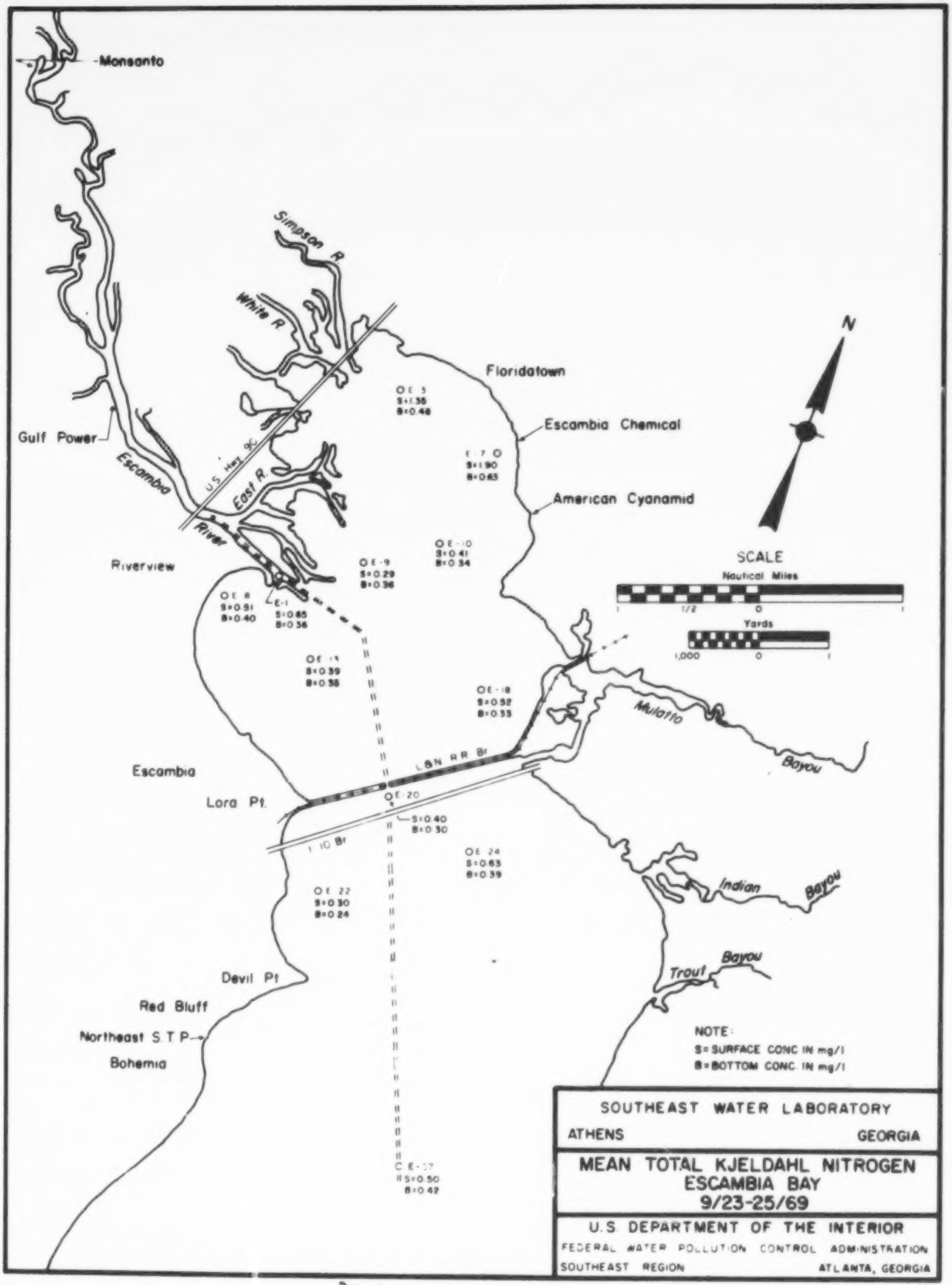
for passage of water. Therefore, any wastes discharged above the trestle will remain in this section of the bay and exercise an organic demand for a longer period of time. This includes all waste sources except the Northeast sewage treatment plant. The present L & N railroad trestle adversely affects water quality in the upper half of Escambia Bay by retarding flushing and exchange. It is recommended that this trestle be reconstructed so as to provide minimum interference with water movement in Escambia Bay.

2) Nitrogen

Figures 17, 18 and 19 show the mean distribution of total kjeldahl nitrogen, ammonia nitrogen and nitrite-nitrate nitrogen in Escambia Bay.

Nitrogen, together with carbon and phosphorus, are the major necessary ingredients in establishing a healthy ecological balance between competing species in Escambia Bay. These three constituents in organic form are stabilized by bacteria utilizing dissolved oxygen from the water. The stabilized materials, now in inorganic form, are available to the algae who produce dissolved oxygen. As algae, bacteria, and other organisms die, the carbon, nitrogen and phosphorus contained in their biomass again become sources of nutrients for succeeding generations in this cyclic process. The discharge of excessive wastes containing carbon, nitrogen and phosphorus, upsets this balance and causes a stimulation of both bacterial and algal populations. The water becomes more noticeably turbid and, as the result of respiration by the increased populations, there is a great increase in oxygen consumption resulting in a significant lowering of dissolved oxygen during the night.

FIGURE 17



Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
Gulf Power
Escambia
River
U.S. Hwy. 90
East R.
American Cyanamid
N
SCALE
Nautical Miles
1/2
0
1
Yards
1,000
0
1
Riverview
E-5
S=1.35
B=0.48
E-7
S=1.90
B=0.65
E-10
S=0.41
B=0.34
E-9
S=0.29
B=0.36
E-8
S=0.91
B=0.40
E-1
S=0.65
B=0.36
E-19
S=0.39
B=0.38
E-18
S=0.52
B=0.33
Mulatto
Bayou
L&N RR Br
Escambia
Lora Pt.
E-20
S=0.40
B=0.30
I-10 Br
E-24
S=0.65
B=0.39
E-22
S=0.30
B=0.24
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
NOTE:
S=SURFACE CONC IN mg/l
B=BOTTOM CONC. IN mg/l
E-27
S=0.50
B=0.42

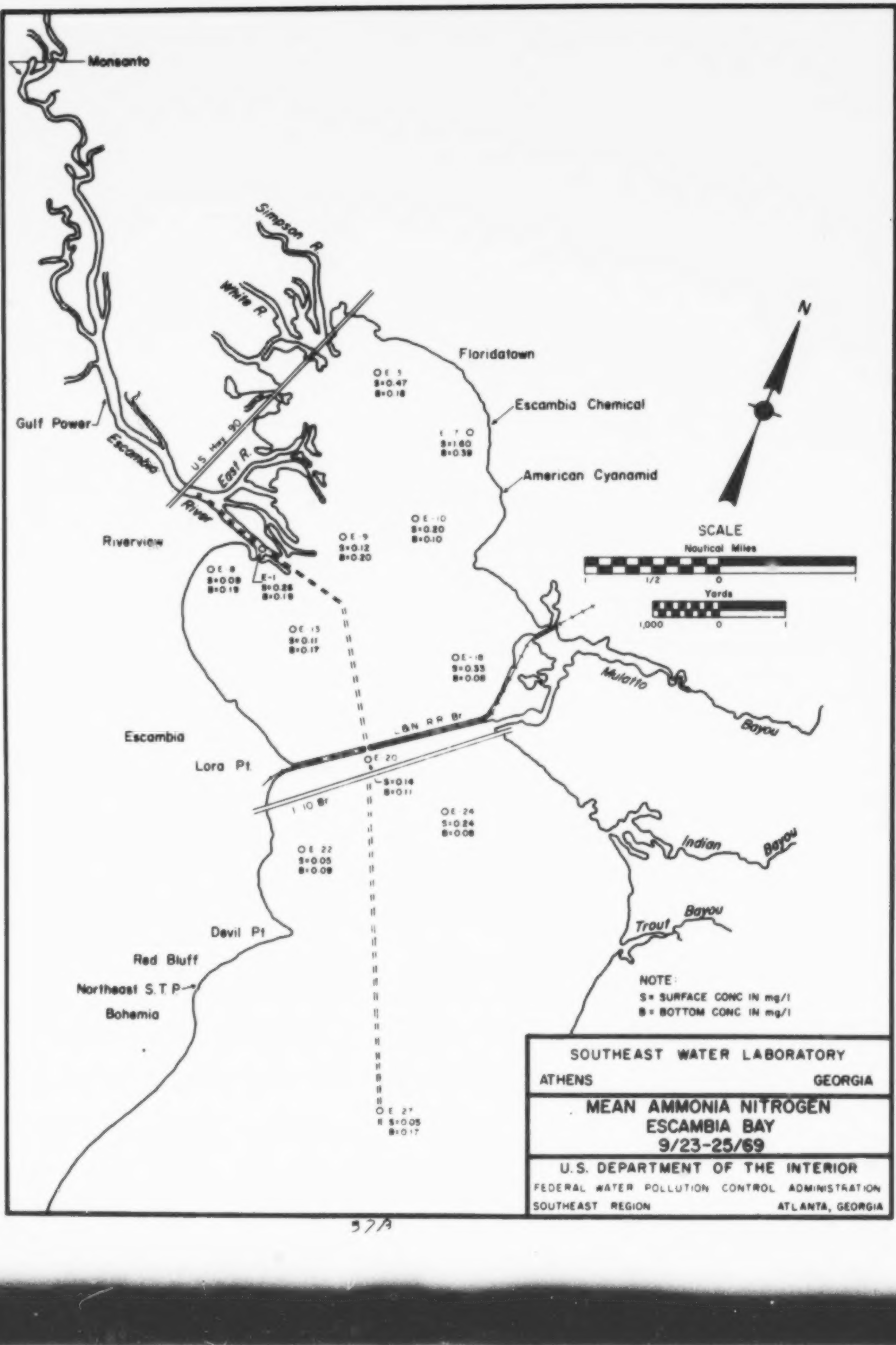
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN TOTAL KJELDAHL NITROGEN
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

31-A

FIGURE 18

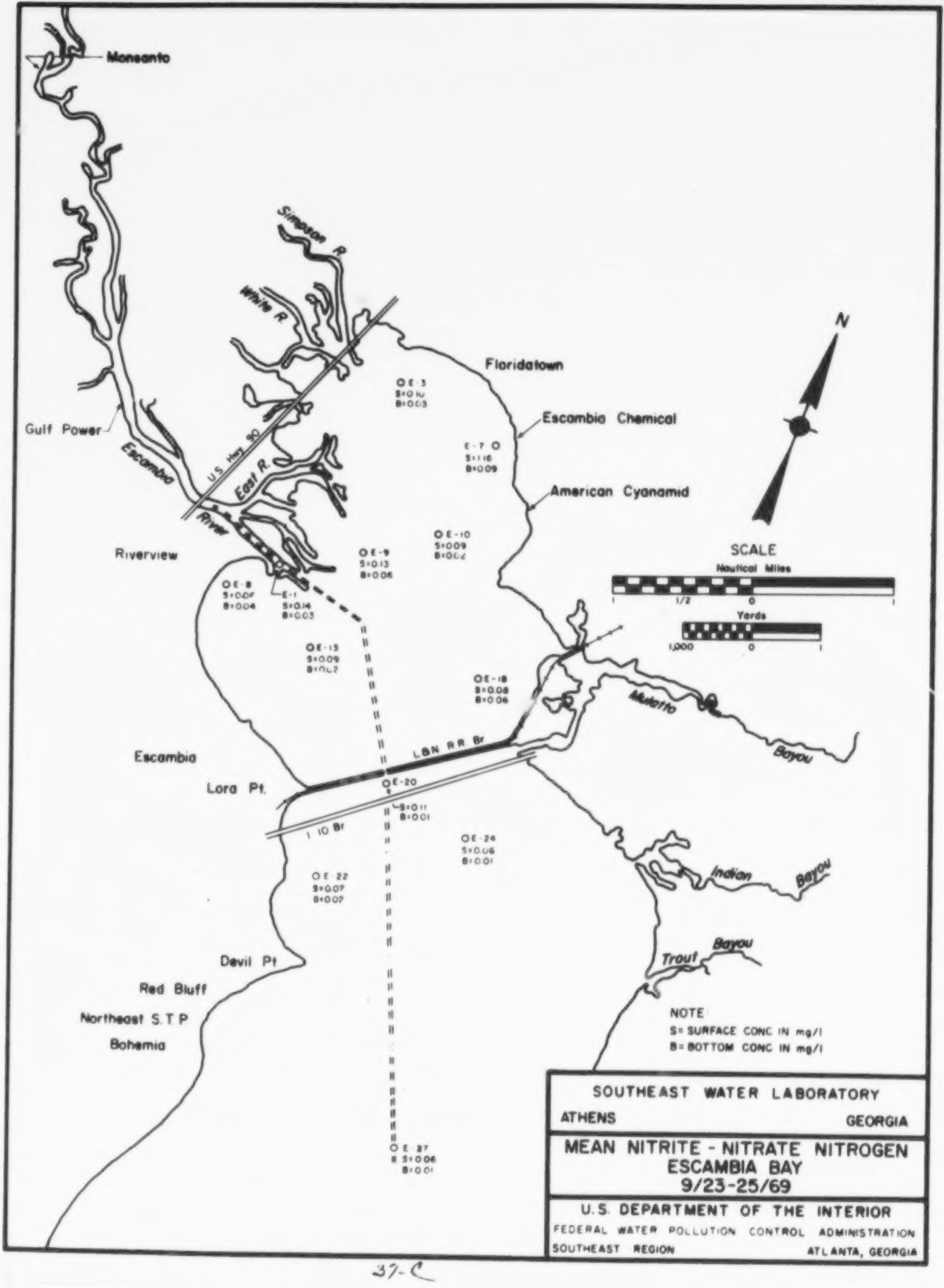

Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia
River
U.S. Hwy 90
East R.
Riverview
N
SCALE
Nautical Miles
1/2
0
1
Yards
1,000
0
1
O E-5
S=0.47
B=0.18
E-7 O
S=1.60
B=0.39
O E-10
S=0.20
B=0.10
O E-9
S=0.12
B=0.20
O E-8
S=0.09
B=0.19
E-1
S=0.28
B=0.19
O E-13
S=0.11
B=0.17
O E-18
S=0.33
B=0.08
Mulatto
Bayou
L&N RR Br
Escambia
Lora Pt.
O E-20
S=0.14
B=0.11
I 10 Br
O E-24
S=0.24
B=0.08
O E-22
S=0.05
B=0.09
Indian
Bayou
Trout
Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
O E-27
S=0.05
B=0.17
NOTE:
S= SURFACE CONC IN mg/l
B= BOTTOM CONC IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN AMMONIA NITROGEN
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 19


Monsanto
Simpson R.
White R.
Floridatown
Gulf Power
Escambia Chemical
U.S. Hwy. 90
East R.
Escambia
River
American Cyanamid
Riverview
E-3
S=0.10
B=0.03
E-7
S=1.16
B=0.09
E-10
S=0.09
B=0.02
E-9
S=0.13
B=0.06
E-8
S=0.07
B=0.04
E-1
S=0.14
B=0.03
E-13
S=0.09
B=0.02
E-18
S=0.08
B=0.06
N
SCALE
Nautical Miles
1
1/2
0
1
Yards
1,000
0
1
Mulatto
Bayou
Escambia
LBN RR Br
Lora Pt.
E-20
S=0.11
B=0.01
I 10 Br
E-24
S=0.06
B=0.01
E-22
S=0.07
B=0.02
Indian
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
Trout
Bayou
E-27
S=0.06
B=0.01

NOTE:
S= SURFACE CONC IN mg/l
B= BOTTOM CONC IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN NITRITE - NITRATE NITROGEN
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

37-C

Oxygen dependent higher organisms, such as fish, may be stressed to the point where they no longer can survive.

The maximum concentrations of total kjeldahl nitrogen are in the northeast section of the Bay in the vicinity of the Escambia Chemical and American Cyanamid outfalls. These surface values are approximately three to four times greater than other parts of Escambia Bay exhibiting a maximum mean value of 1.90 mg/l near the Escambia Chemical discharge. Concentrations of TKN one foot above the bottom of the bay were relatively constant between 0.3 mg/l and 0.4 mg/l throughout the bay except the northeast section where values about one and one-half times greater were observed. The maximum mean bottom value was 0.63 mg/l, again occurring off the Escambia Chemical outfall. Higher than average surface concentrations of TKN were also observed along the eastern shore of the Bay near Mulatto Bayou.

Ammonia nitrogen exhibited the same distribution pattern as TKN with most of Escambia Bay showing concentrations between 0.1 mg/l and 0.2 mg/l except for the northeast section and, to a lesser extent, the eastern portion. The maximum mean surface concentration of 1.60 mg/l was as much as 32 times greater than the western and central sections of the bay. Bottom concentrations in the northeast part were about four times less than surface values, but were still two to three times greater than bottom concentrations in other sections.

Nitrite-nitrate nitrogen was at a maximum in the northeast section where it was more than ten times greater than the rest of the bay at a surface mean concentration of 1.16 mg/l. Bottom concentrations were all less than 0.1 mg/l

The northeast section of Escambia Bay is excessively over-enriched with nitrogen as the result of the discharges from Escambia Chemical and American Cyanamid. Escambia Chemical, since it discharges the largest quantities of both ammonia nitrogen and nitrite nitrate nitrogen is the more damaging waste. Monsanto Company also discharges a significant quantity of nitrogenous waste, and contributes, in a lesser degree since it is further removed, to the excessive concentrations in the extreme northeast and eastern section of the Escambia Bay. Evaluation of current movement showed that water from the Escambia River flows toward the eastern section of the bay during the flooding phase.

Nitrogen concentrations in Escambia Bay are listed in Table 5.

3) Phosphorus

Only very minute quantities of phosphorus are sufficient in maintaining a healthy biological balance. It is a required nutrient and artificial inputs are amenable to control and abatement. Its availability in excessive concentrations has been connected with large algae populations. Ortho-phosphate is the form most readily available to algae. Figures 20 and 21 illustrate the total and ortho-phosphate distribution in Escambia Bay.

Total phosphate [9] concentrations at the surface of Escambia Bay were highest in the northeast section and in the southwest south of the L & N railroad trestle. The maximum mean concentration observed was 0.292 mg/l offshore of the Escambia Chemical discharge.

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[9] All phosphate values reported as phosphorus (P)

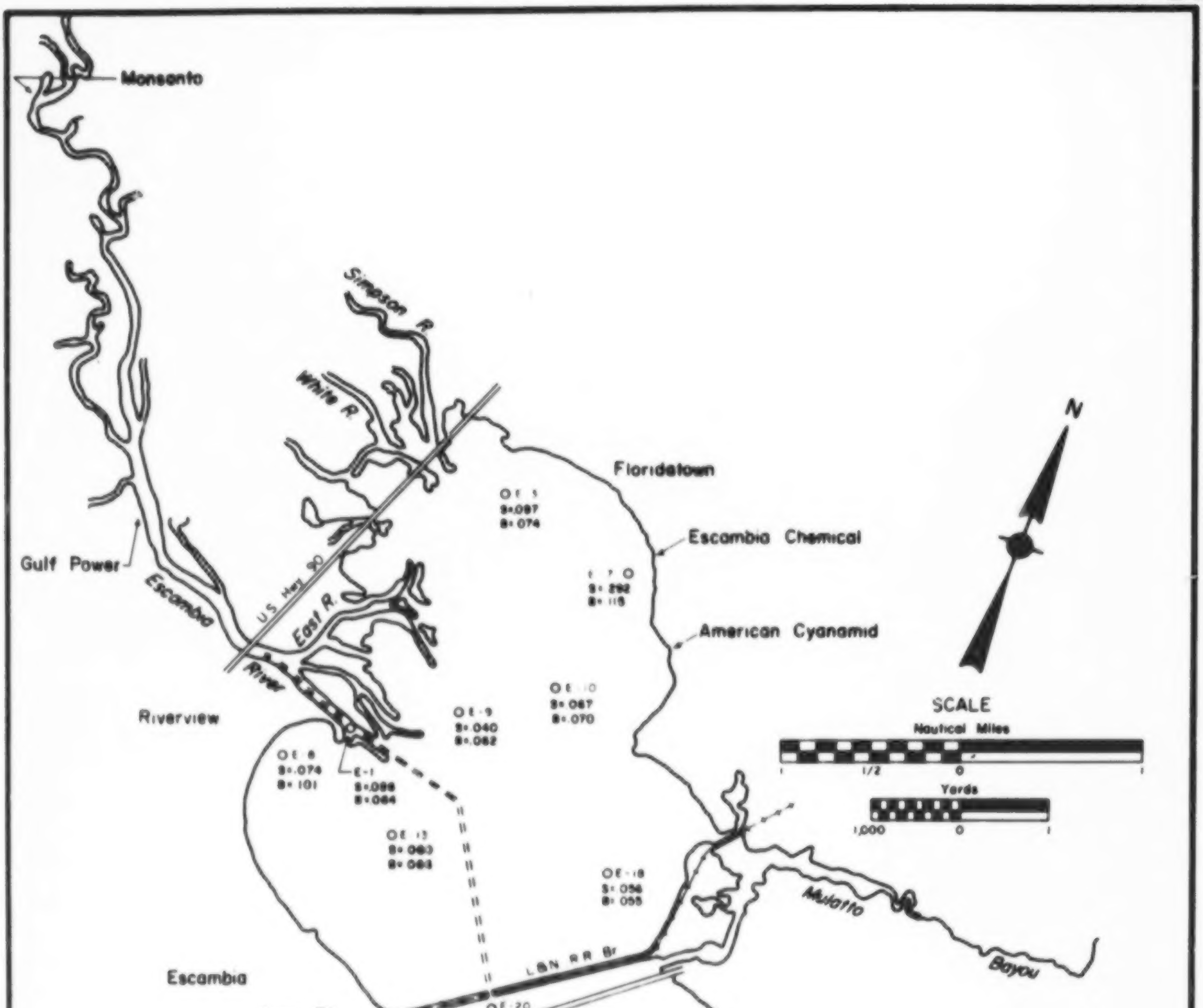
TABLE 5

MEAN NITROGEN CONCENTRATIONS - ESCAMBIA BAY

September 23-25, 1969

Station Location	Total Kjeldahl Nitrogen		Ammonia Nitrogen		Nitrite-Nitrate Nitrogen	
	Surface	Bottom	Surface	Bottom	Surface	Bottom
	mg/l		mg/l		mg/l	
E-1	0.65	0.36	0.26	0.19	0.14	0.03
E-3	1.35	0.48	0.47	0.18	0.10	0.03
E-7	1.90	0.63	1.60	0.39	1.16	0.09
E-8	0.51	0.40	0.09	0.19	0.06	0.04
E-9	0.29	0.36	0.12	0.12	0.13	0.06
E-10	0.41	0.34	0.20	0.10	0.09	0.02
E-13	0.39	0.35	0.11	0.17	0.09	0.02
E-18	0.52	0.33	0.33	0.08	0.08	0.06
E-20	0.40	0.30	0.14	0.11	0.11	0.01
E-22	0.30	0.24	0.05	0.09	0.07	0.02
E-24	0.63	0.34	0.24	0.08	0.06	0.01
E-27	0.50	0.42	0.05	0.17	0.06	0.01

FIGURE 20


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia
U.S. Hwy 90
East R.
River
Riverview
N
SCALE
Nautical Miles
1
1/2
0
1
Yards
1,000
0
1
E-5
S=.097
B=.074
E-7
S=.292
B=.115
E-10
S=.067
B=.070
E-9
S=.040
B=.082
E-8
S=.074
B=.101
E-1
S=.099
B=.064
E-13
S=.063
B=.063
E-18
S=.056
B=.055
Mulatto
Bayou
L&N RR Br
Escambia
Lora Pt.
E-20
S=.083
B=.076
I-10 Br
E-24
S=.096
B=.040
E-22
S=.112
B=.029
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
E-27
S=.049
B=.046

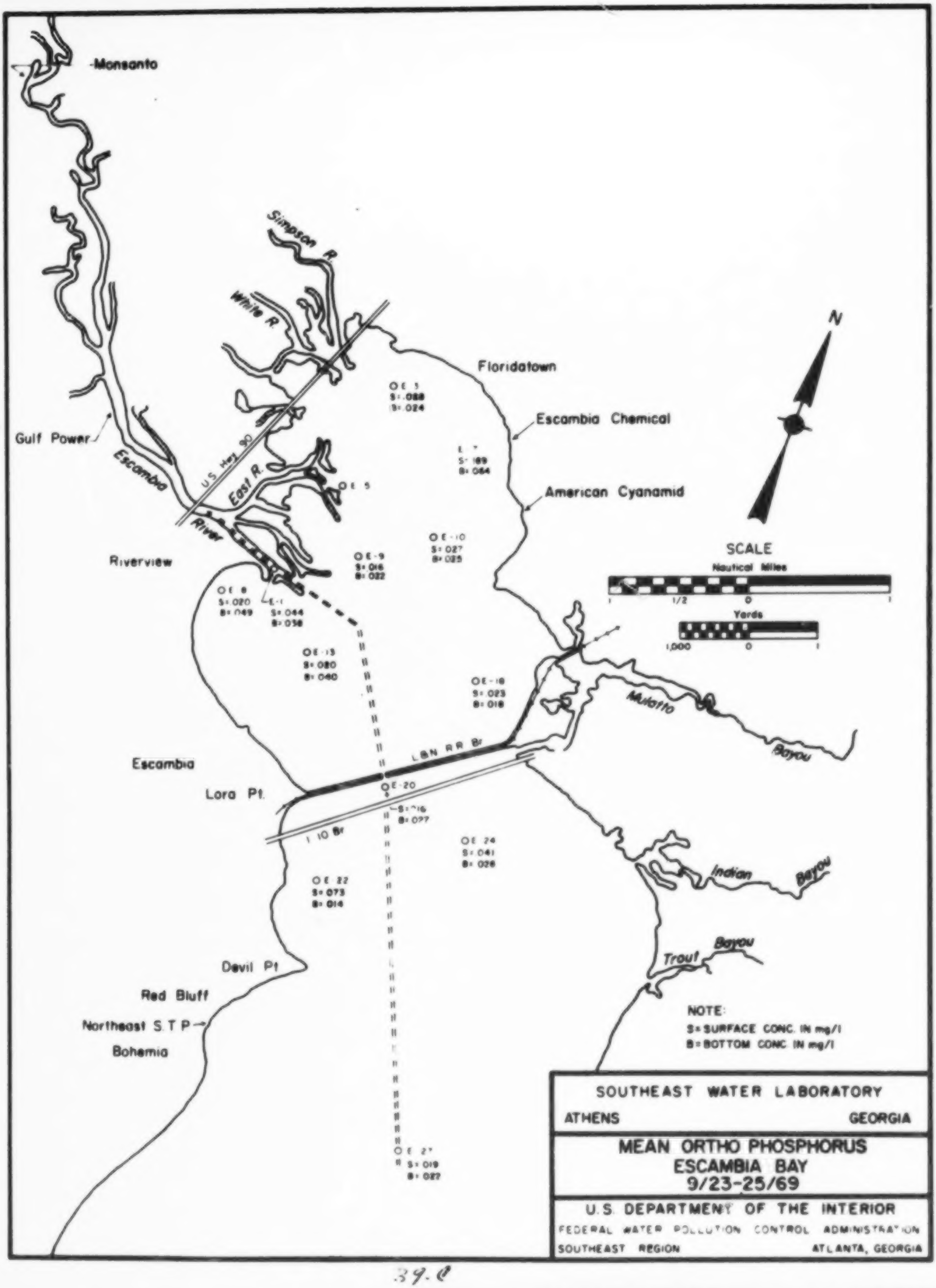
NOTE:
S = SURFACE CONC. IN mg/l
B = BOTTOM CONC. IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN TOTAL PHOSPHORUS
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 21



Monsanto
Simpson R.
White R.
Floridatown
Gulf Power
Escambia River
U.S. Hwy. 90
East R.
Escambia Chemical
American Cyanamid
Riverview
E-3 S=.088 B=.024
E-7 S=.189 B=.064
E-5
E-10 S=.027 B=.025
E-9 S=.016 B=.022
E-8 S=.020 B=.049
E-1 S=.044 B=.038
E-13 S=.080 B=.040
E-18 S=.023 B=.018
Mulatto Bayou
L&N RR Br
Escambia
Lora Pt.
E-20 S=.?16 B=.027
I 10 Br
E-24 S=.041 B=.028
E-22 S=.073 B=.014
Indian Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
Trout Bayou
E-27 S=.019 B=.027
N
SCALE
Nautical Miles
1/2
0
1
Yards
1,000
0
1

NOTE:
S=SURFACE CONC. IN mg/l
B=BOTTOM CONC. IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN ORTHO PHOSPHORUS
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

The second highest surface concentration of 0.112 mg/l was observed just north of the effluent discharge from the City of Pensacola's Northeast sewage treatment plant. Concentrations in the area immediately south of the L & N bridge were generally higher than the central and western part of the bay north of the bridge. Concentrations, both on the surface and bottom were slightly higher on the western side than the central section. The bottom distribution of total phosphate was also higher in the northeast section showing a maximum value of 0.115 mg/l offshore of Escambia Chemical. However, concentrations south of the L & N bridge were generally lower than those north of the bridge except in the ship channel immediately south of the bridge.

Ortho-phosphate concentrations exhibited the same distribution as total phosphate with the maximum concentrations of 0.189 mg/l and 0.064 mg/l for surface and bottom respectively, being observed offshore of Escambia Chemical. The second highest surface concentration of 0.073 mg/l was north of the outfall from the Northeast sewage treatment plant. Ortho-phosphate concentrations on the bottom were generally higher north of the L & N bridge than south.

The major waste effluent affecting phosphate concentrations in the northeast section of Escambia Bay is Escambia Chemical Company, the largest discharger of ortho-phosphate of all waste sources. The source of the high surface total and ortho-phosphate in the southwest part of the bay is the Northeast sewage treatment plant effluent. The concentrations of phosphate on the western side of the bay above the L & N bridge are affected by the effluent from the Monsanto Company and, to a much lesser extent, from Container Corporation.

On the ebbing current, effluent from Monsanto flows out of the Escambia River and south along the western side of the Bay. Monsanto discharges 38.1% of the total phosphate and 34.7% of the ortho-phosphate from all waste sources. Container Corporation discharges 13.6% of the total phosphate and 9.6% of the ortho-phosphate.

Phosphate concentrations in Escambia Bay are listed in Table 6.

4) Dissolved Oxygen

The mean surface dissolved oxygen concentrations in Escambia Bay is shown in Figure 22. This figure is shown as lines of equal concentration (isolines) to demonstrate dissolved oxygen variation throughout the bay. There are four factors which may directly affect DO in Escambia Bay: stabilization of soluble or suspended oxygen demanding materials; stabilization of bottom deposits containing high organic content; photosynthesis and respiration by algae; and reaeration. Soluble and suspended oxygen demanding materials may be characterized using theoretical oxygen demand (TOD) concentrations. Benthic demand may be evaluated from a consideration of organic carbon content of bottom deposits. Phytoplankton concentrations, as well as variation in dissolved oxygen at a point with time, are indicators of photosynthetic effects. Reaeration has a minor effect on DO in Escambia Bay relative to the other three phenomena. Flushing and exchange of water out of Escambia Bay is also limited with respect to the upper section of the bay.

Mean concentrations of DO at the surface of Escambia Bay were all greater than 4.0 mg/l, the official Florida criterion. The lowest mean concentrations were observed in the northern section near the marsh flats.

TABLE 6

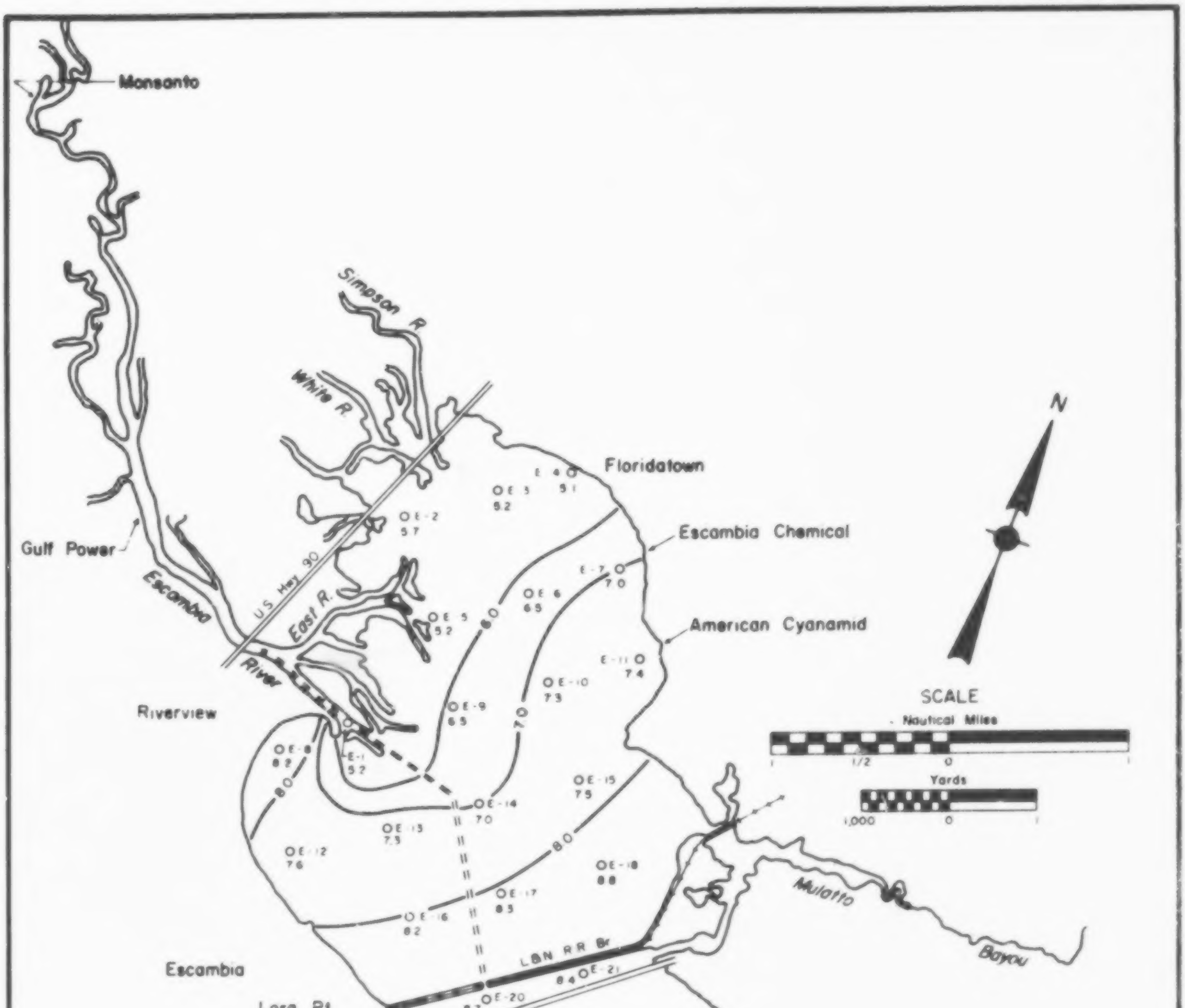
MEAN PHOSPHATE CONCENTRATIONS - ESCAMBIA BAY

September 23-25, 1969

Station Location	Total Phosphate*		Ortho-Phosphate as Phosphorus	
	Surface	Bottom	Surface	Bottom
	mg/l		mg/l	
E-1	.056	.064	.044	.038
E-3	.097	.074	.028	.024
E-7	.292	.115	.189	.064
E-8	.074	.101	.020	.049
E-9	.040	.062	.016	.022
E-10	.067	.070	.027	.025
E-13	.060	.066	.020	.040
E-18	.056	.055	.023	.018
E-20	.083	.076	.016	.027
E-22	.112	.029	.073	.014
E-24	.096	.040	.041	.026
E-27	.049	.046	.019	.022

* As P

FIGURE 22


Monsanto
Gulf Power
Escambia River
U.S. Hwy 90
East R.
White R.
Simpson R.
Floridatown
Escambia Chemical
American Cyanamid
Riverview
Escambia
Lora Pt.
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
Mulatto Bayou
Indian Bayou
Trout Bayou
L&N RR Br
I 10 Br
N
SCALE
Nautical Miles
1 1/2 0 1
Yards
1,000 0 1
E-1 5.2
E-2 5.7
E-3 5.2
E-4 5.1
E-5 5.2
E-6 6.5
E-7 7.0
E-8 8.2
E-9 6.5
E-10 7.3
E-11 7.4
E-12 7.6
E-13 7.3
E-14 7.0
E-15 7.5
E-16 8.2
E-17 8.3
E-18 8.8
E-19 8.4
E-20 8.7
E-21 8.4
E-22 8.8
E-23 8.7
E-24 8.5
E-25 9.0
E-26 8.9
E-27 9.5
E-28 8.7
6.0
7.0
8.0
8.0
9.0
NOTE
4.0 = DO CONC IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

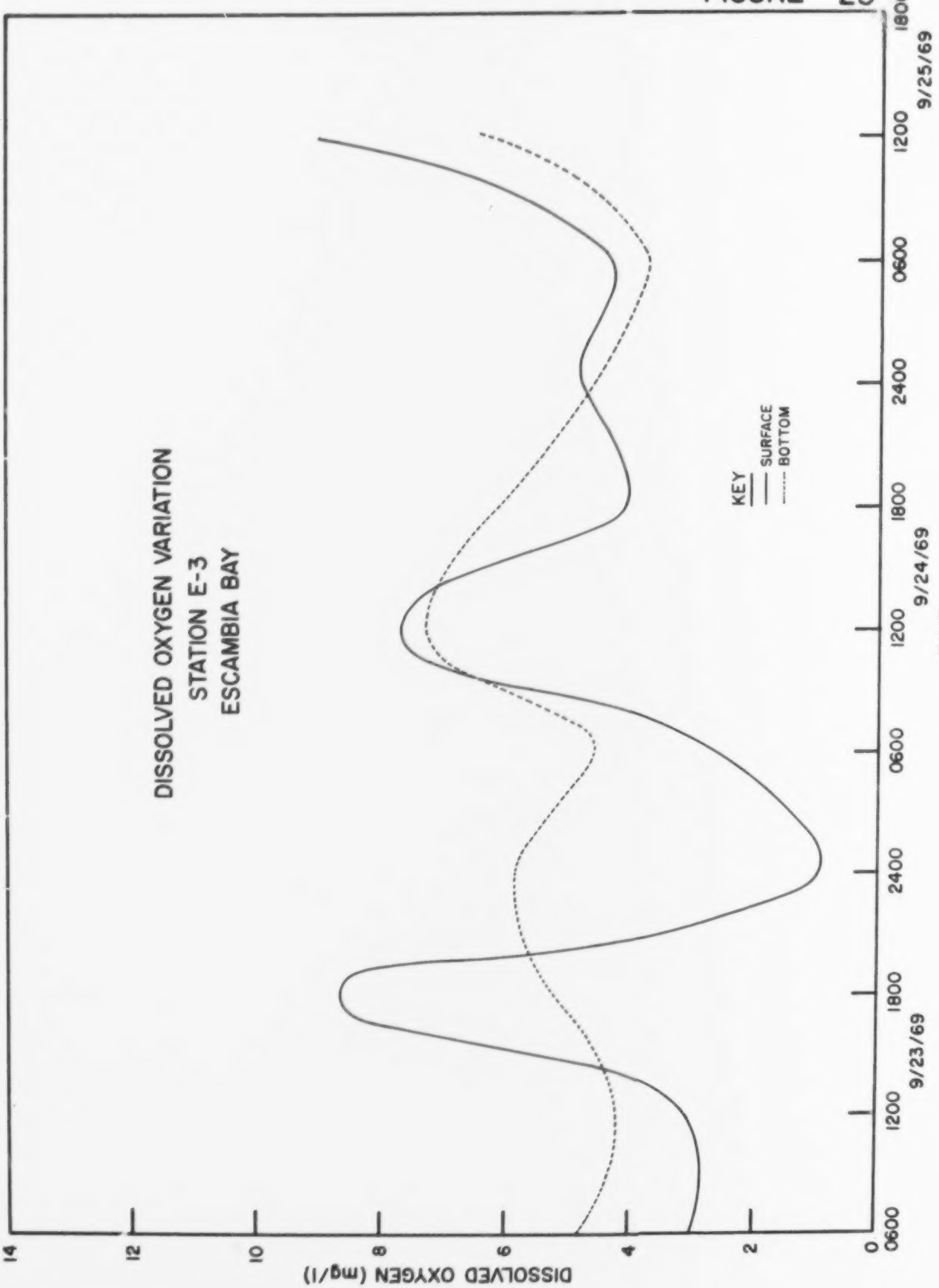
MEAN SURFACE DISSOLVED OXYGEN
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

41-B

These concentrations were greater than 5.0 mg/l. Surface concentrations in the central and southern portions of the bay were generally between 7.0 and 9.0 mg/l. However, there is a great amount of variation in almost all of the locations sampled north of the L & N railroad bridge. Figure 23 shows this variation for sampling location E-3 in the extreme northern Bay. The maximum surface concentration observed was 8.3 mg/l while the minimum was 1.0 mg/l. Forty percent of the samples were less than 4.0 mg/l. The higher concentrations invariably occur during daylight and the lower values are observed at night. This is a classical DO distribution caused by variation in algal photosynthesis. The bay is relatively shallow and has poor circulation in this section. It also is the section of the bay containing the highest nutrient concentrations. All of these factors are conducive to increased algal activity and production. Because phytoplankton activity, dissolved oxygen concentrations on the surface in the northern section of the bay frequently are less than 4.0 mg/l and could conceivably be completely absent with the warmer water temperatures which occur during July and August. These variations are partially responsible for the fish kills occurring in the northern section of the bay. Fish may swim into the area during the day when DO is high, since the marshes are a natural source of food supply, and become trapped when there is a rapid decline after sunset. The major stimulants to excessive planktonic photosynthesis and respiration in the northern section of the bay are the excessive quantities of carbon and nitrogen discharged by the American Cyanamid Company, and of nitrogen and phosphate discharged by Escambia Chemical Company.

FIGURE 23



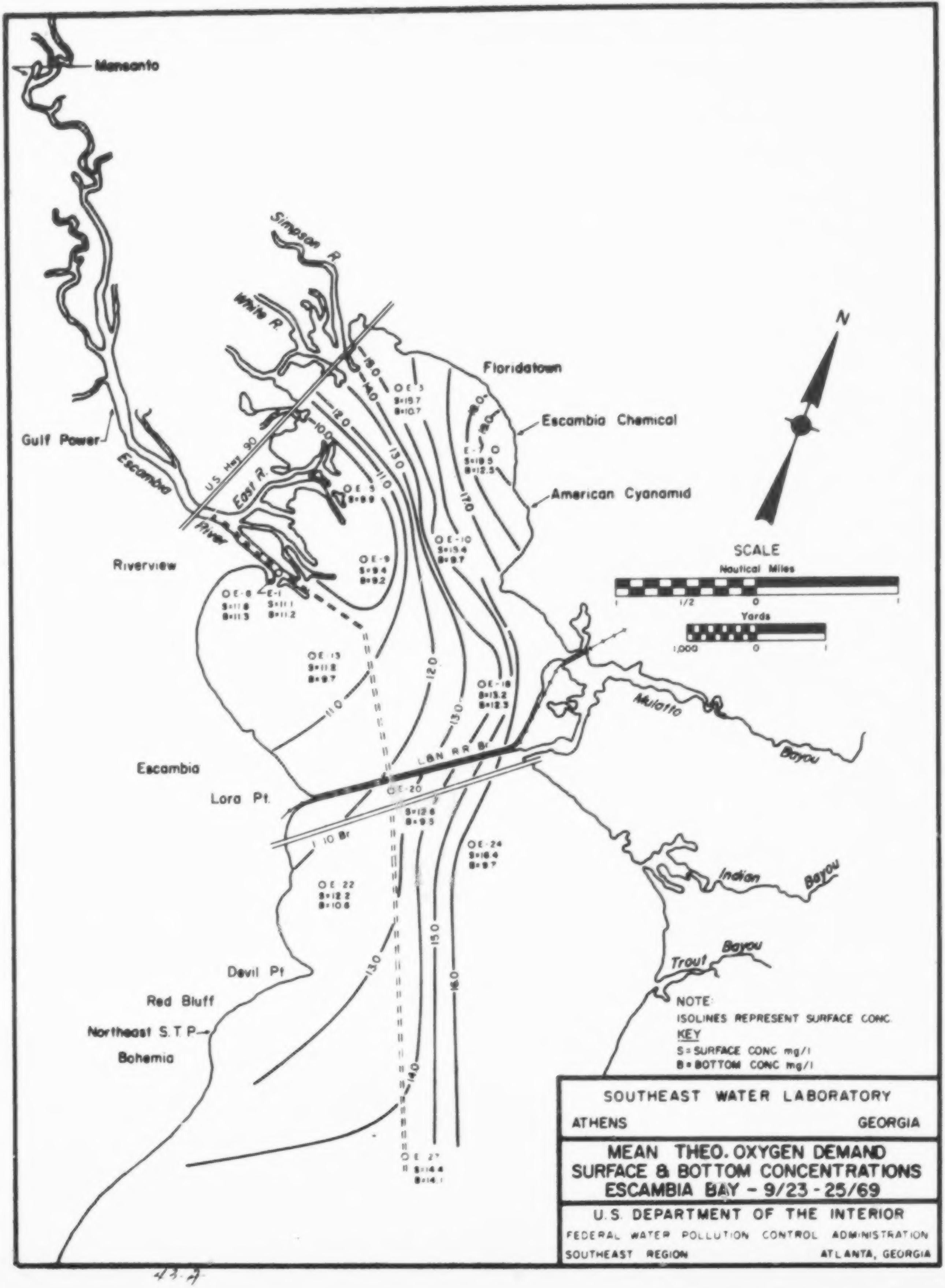
DISSOLVED OXYGEN VARIATION
STATION E-3
ESCAMBIA BAY

The effect of these wastes is demonstrated by consideration of the mean TOD distribution shown in Figure 24. The highest surface concentrations are in the vicinity of these outfalls and are almost twice as high as the remainder of the bay. Bottom concentrations are also higher. These concentrations show the potential oxygen demand from unstabilized soluble or suspended organic material. In addition to respiration by algae, dissolved oxygen can be reduced directly through stabilization of this pollution.

Photosynthesis and respiration by algae are apparent in all areas of the bay north of the L & N railroad bridge. Figure 25 shows the DO variation at sampling location E-9 in the central part of the upper bay. The range was from 5.0 mg/l to 11.8 mg/l. Although none of the surface observations were less than 4.0 mg/l, this range of 6.8 mg/l is indicative of a highly enriched environment. Figure 26 is representative of DO variation in the eastern section of the upper bay. The surface range at this location (E-18) is also 6.8 mg/l. Variation in the lower bay is significantly less reflecting the improved flushing and exchange as well as the generally lower concentration of nutrient material. At location E-27 (Figure 27), if the initial observation is excluded, the surface range is about 3.5 mg/l with a mean of 8.7 mg/l. There is very little variation in the bottom DO.

Although phytoplankton populations are not, of themselves, directly correlated with activity manifested through photosynthesis and respiration, they do illustrate imbalances in numbers within the system. On one of the sampling excursions, phytoplankton samples were collected from the surface on an ebbing current during daylight hours.

FIGURE 24



Monsanto
Simpson R
White R.
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia
River
U.S. Hwy 90
East R.
Riverview
Escambia
Lora Pt.
L&N RR Br
I 10 Br
Mulatto
Bayou
Indian
Bayou
Trout
Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
N
SCALE
Nautical Miles
1
1/2
0
1
Yards
1,000
0
1
E-3
S=15.7
B=10.7
E-7
S=19.5
B=12.5
E-5
S=9.9
E-10
S=15.4
B=9.7
E-9
S=9.4
B=9.2
E-8
S=11.8
B=11.3
E-1
S=11.1
B=11.2
E-13
S=11.8
B=9.7
E-18
S=13.2
B=12.3
E-20
S=12.6
B=9.5
E-24
S=16.4
B=9.7
E-22
S=12.2
B=10.6
E-27
S=14.4
B=14.1
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0

NOTE:
ISOLINES REPRESENT SURFACE CONC.
KEY
S = SURFACE CONC mg/l
B = BOTTOM CONC mg/l

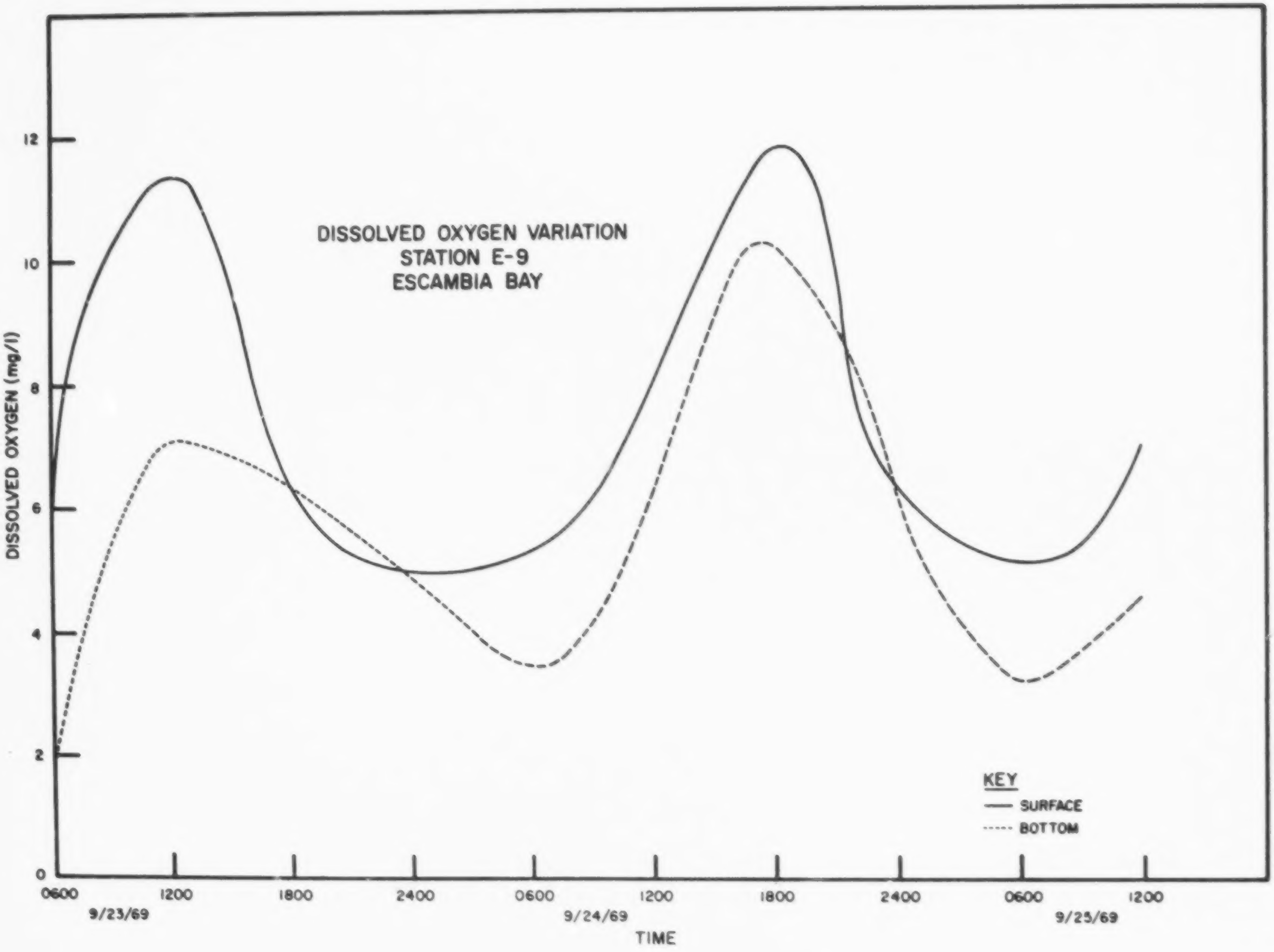
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MEAN THEO. OXYGEN DEMAND
SURFACE & BOTTOM CONCENTRATIONS
ESCAMBIA BAY - 9/23-25/69

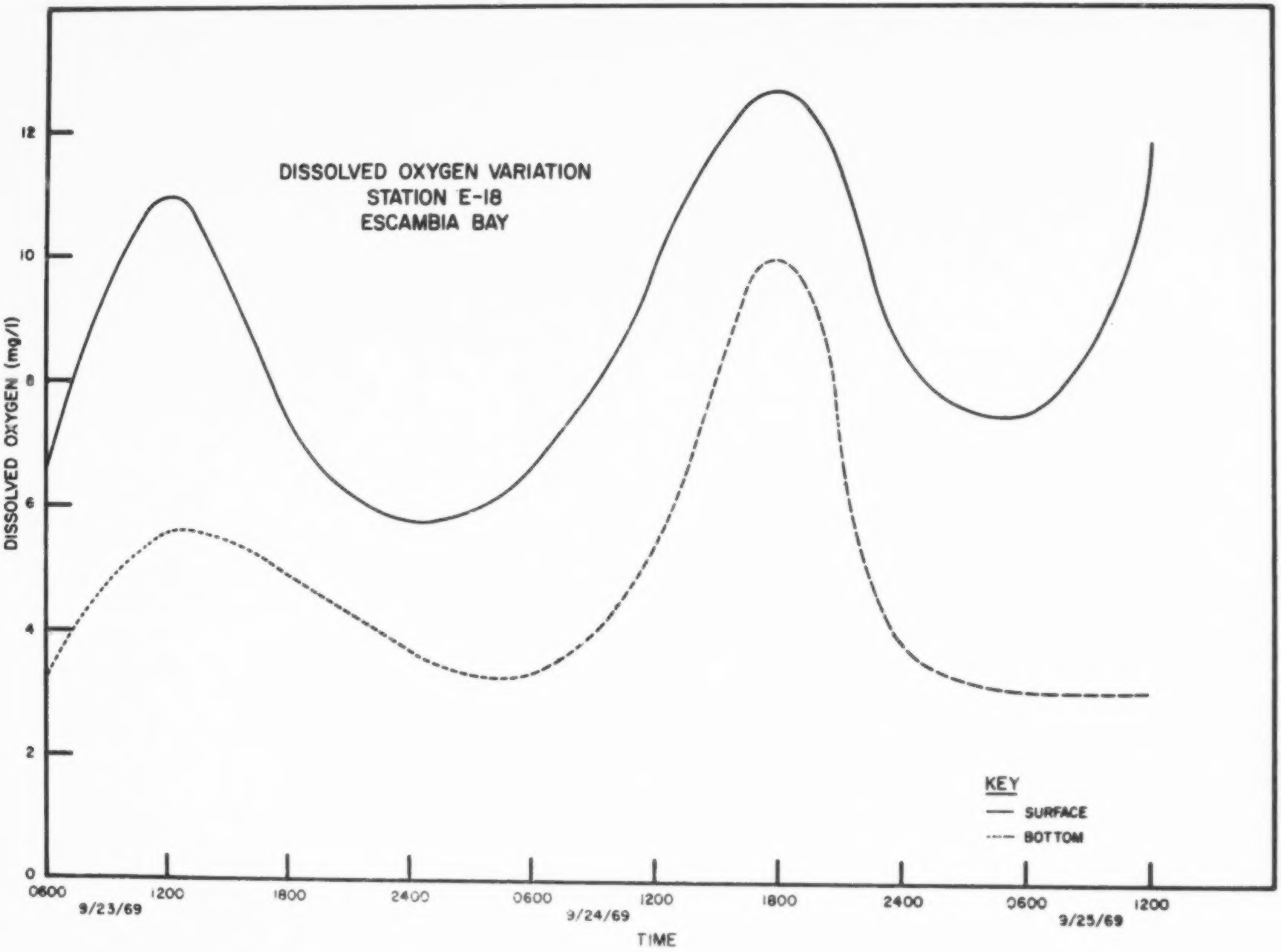
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

43-A

FIGURE 25



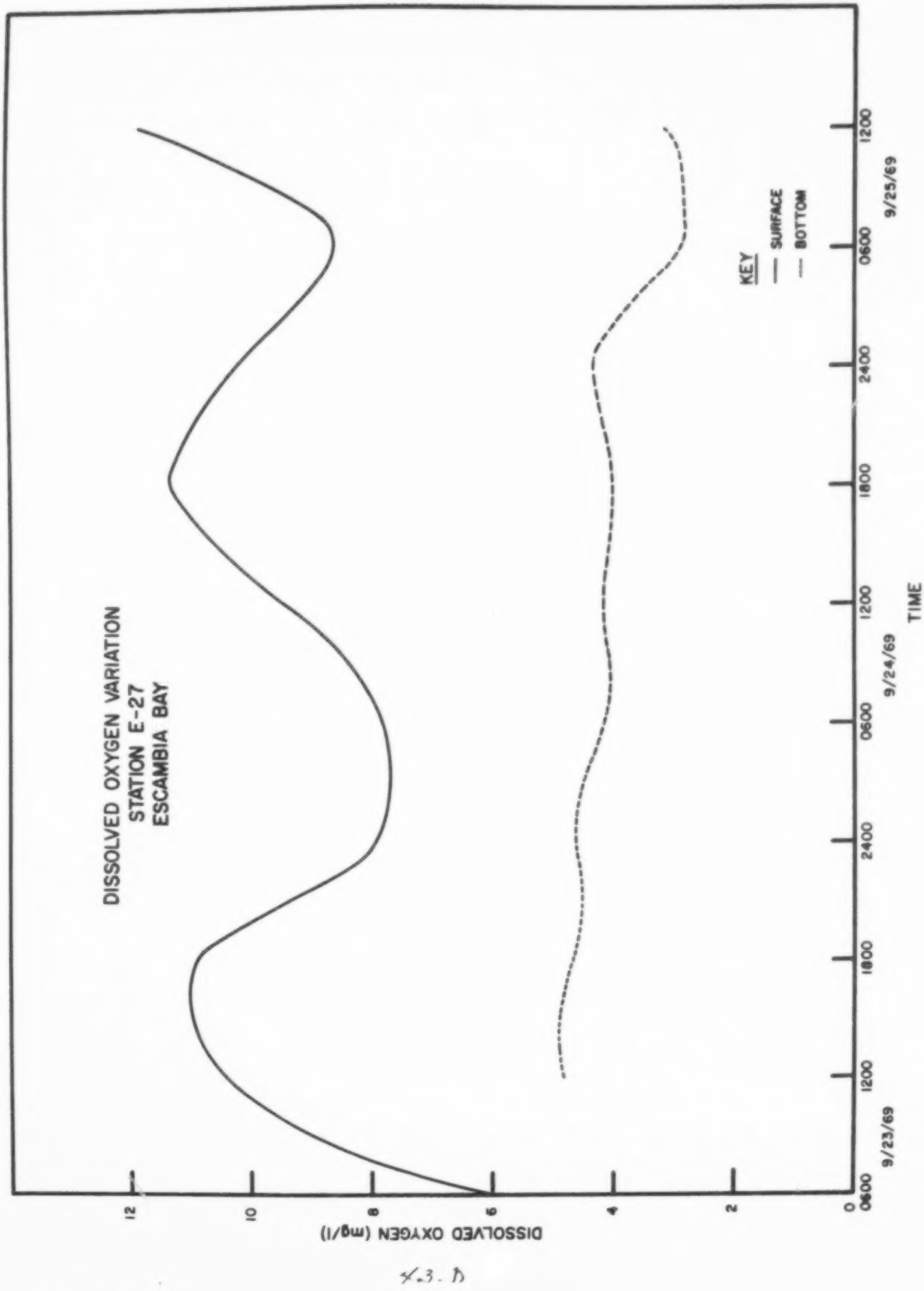
43.13



43 c

FIGURE 26

FIGURE 27



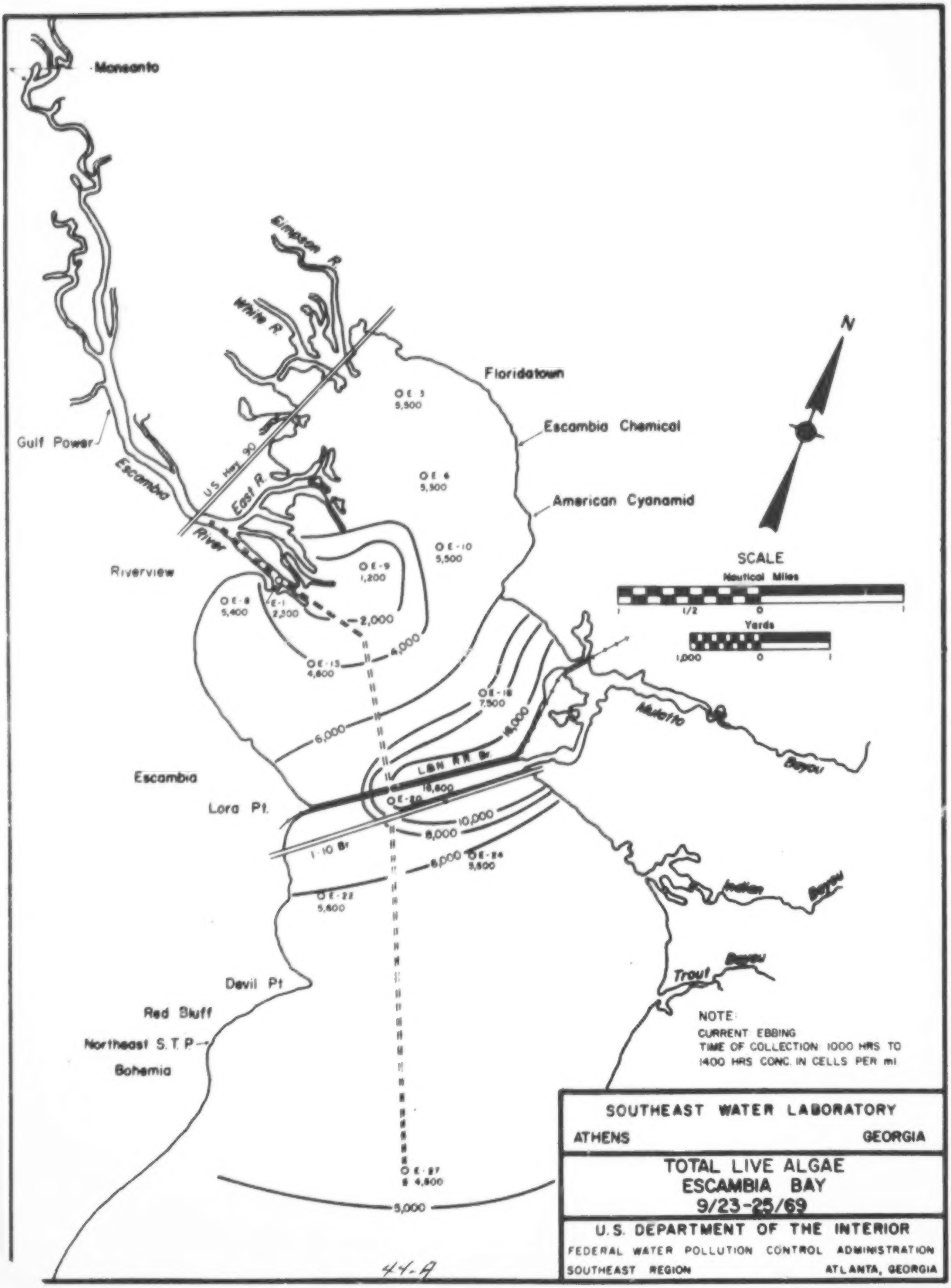
4.3. D

Figure 28 shows the phytoplankton distribution at this time. The population in most of the bay is relatively constant between 5,000 and 6,000 cells per ml. Most of these phytoplankton grow in the bay, as the bay concentrations are two to three times greater than in the Escambia River. However, in the vicinity of the southern entrance to Mulatto Bayou, the populations rapidly increase to about three times the concentration in the rest of Escambia Bay. The source of these phytoplankton populations is Mulatto Bayou. It is also the major source of the high nitrogen and phosphorus concentrations observed on the eastern side of the bay below the L & N bridge. On the ebbing current, Mulatto Bayou is a contributor of nutrient and oxygen demanding materials to Escambia Bay.

Figures 23, 25, 26, and 27 show that there is a significantly lesser concentration of dissolved oxygen near the bottom of Escambia Bay compared to the surface. Figure 29 illustrates only the 4.0 mg/l isoline for the mean value of bottom DO. The entire volume of the deeper water within this isoline had dissolved oxygen concentrations of less than 4.0 mg/l. This represents about 43% of the area of the bay and includes all of the central and northern section of the bay except for the marsh flats section in the north. Above the L & N railroad bridge the percentage of the bay less than 4.0 mg/l is about 60%. Two of the sampling locations within this area had mean DO concentrations of slightly greater than 4.0 mg/l but these means are strongly influenced by a few anomalously high individual values.

The oxygen demand of benthic deposits is the major factor affecting DO in the bottom water. To a lesser extent, the TOD also causes lower oxygen concentrations.

FIGURE 28


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia River
U.S. Hwy 90
East R.
Riverview
E-5 5,500
E-6 5,300
E-10 5,500
E-9 1,200
E-8 5,400
E-1 2,300
2,000
4,000
E-13 4,600
E-18 7,500
6,000
18,000
LBN RR Br
18,600
E-20
10,000
8,000
6,000
E-24 5,800
I-10 Br
E-22 5,600
Escambia
Lora Pt.
Mulatto Bayou
Indian Bayou
Trout Bayou
Devil Pt
Red Bluff
Northeast S.T.P.
Bohemia
E-27 4,800
5,000
N
SCALE
Nautical Miles
1 1/2 0 1
Yards
1,000 0 1

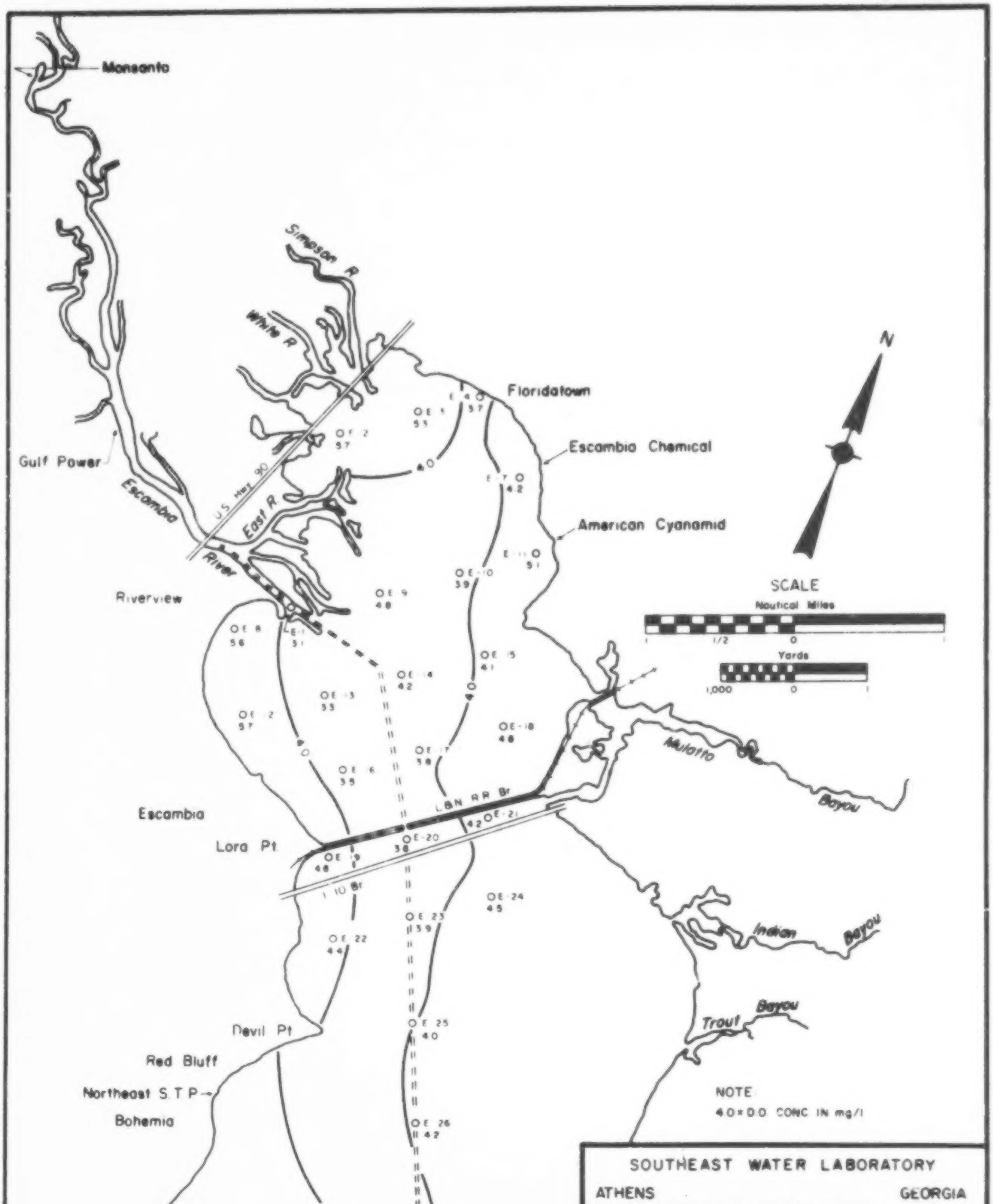
NOTE:
CURRENT: EBBING
TIME OF COLLECTION: 1000 HRS TO 1400 HRS CONC. IN CELLS PER ml

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

TOTAL LIVE ALGAE
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 29


Monsanto
Simpson R
White R
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia River
East R.
U.S. Hwy 90
Riverview
Escambia
Lora Pt.
L&N RR Br
I-10 Br
Devil Pt
Red Bluff
Northeast S.T.P.→
Bohemia
Mulatto Bayou
Indian Bayou
Trout Bayou
N
SCALE
Nautical Miles
1/2
0
1
Yards
1,000
0
1
E-1 5.1
E-2 5.7
E-3 5.1
E-4 3.7
E-7 4.2
E-8 5.6
E-9 4.8
E-10 3.9
E-11 5.1
E-12 5.7
E-13 3.3
E-14 4.2
E-15 4.1
E-16 3.5
E-17 3.8
E-18 4.8
E-19 4.8
E-20 3.6
E-21 4.2
E-22 4.4
E-23 3.9
E-24 4.5
E-25 4.0
E-26 4.2
E-27 3.7
E-28 4.7
4.0
NOTE:
4.0 = D.O. CONC. IN mg/l

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

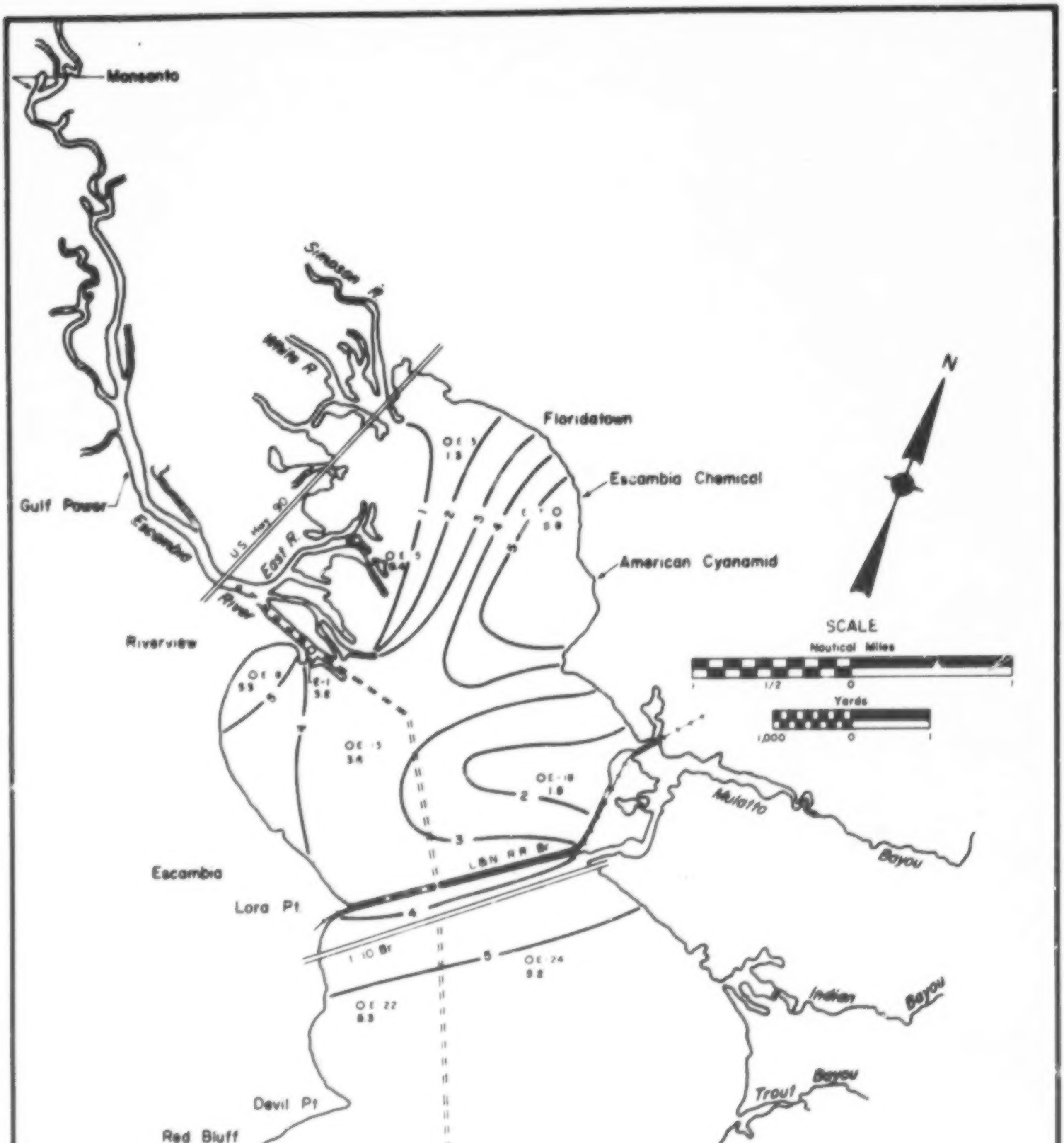
MEAN BOTTOM DISSOLVED OXYGEN
ESCAMBIA BAY
9/23-25/69

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

Reaeration, as a means of increasing DO is negligible due to the salinity stratification and poor vertical mixing. If bottom material contains greater than 3.0% organic carbon content by weight, it will most likely exert a high oxygen demand on the overlying water and can be characterized as a sludge deposit. (10) By this criterion, a significant proportion of the bottom of Escambia Bay, north of the L & N Bridge amounting to more than 57% of the area is covered with a blanket of oxygen demanding sludge. The only sections with less than 3% organic carbon content are the extreme northern part, and the area around the mouth of Mulatto Bayou. The sludge distribution in Escambia Bay is shown in Figure 30. The highest concentrations of sludge deposits in Escambia Bay are centered around the American Cyanamid and Escambia Chemical outfalls. Organic carbon content in this area is nearly 6%. The percentage of volatile solids, based on total solids, in the effluents of American Cyanamid and Escambia Chemical are 72% and 93% respectively. Monsanto Company discharges 48% volatile solids and Container Corporation discharges 80% volatile solids. Some of this volatile solid load from these latter industries contributes to the sludge deposits in the central portion of the bay north of the L & N railroad bridge. Upstream land runoff in the Escambia River watershed also deposits volatile solids in Escambia Bay.

The entire upper section of Escambia Bay north of the L & N rialroad bridge is in a state of accelerated eutrophication as shown by unstable DO variations caused by excessive phytoplanktonic photosynthesis and respiration; high carbon nitrogen and phosphorus concentrations; and excessive oxygen demanding sludge deposits.

FIGURE 30


Monsanto
Simpson R.
White R.
Floridatown
Escambia Chemical
American Cyanamid
Gulf Power
Escambia
River
U.S. Hwy 90
East R.
N
SCALE
Nautical Miles
1 1/2 0 1
Yards
1,000 0 1
Riverview
E-3
1.3
E-7
3.8
E-5
E-8
3.3
E-1
3.8
E-13
3.4
E-16
1.8
1
2
3
4
5
Mulatto
Bayou
L&N RR Br
Escambia
Lora Pt.
I-10 Br
E-24
3.2
E-22
3.3
Indian
Bayou
Trout
Bayou
Devil Pt.
Red Bluff
Northeast S.T.P.
Bohemia
E-27
5.6

NOTE:
5.6 = % ORGANIC CARBON BY WEIGHT

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

PERCENT ORGANIC CARBON
BOTTOM MUD SAMPLES
ESCAMBIA BAY

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

45-A

The major sources of artificial pollution causing these conditions are the Escambia Chemical Company, American Cyanamid Company and, to a lesser extent, the Monsanto Company. Container Corporation of America and the Northeast sewage treatment plant are relatively minor contributors of carbon and phosphorus, in terms of the effects on water quality in the bay.

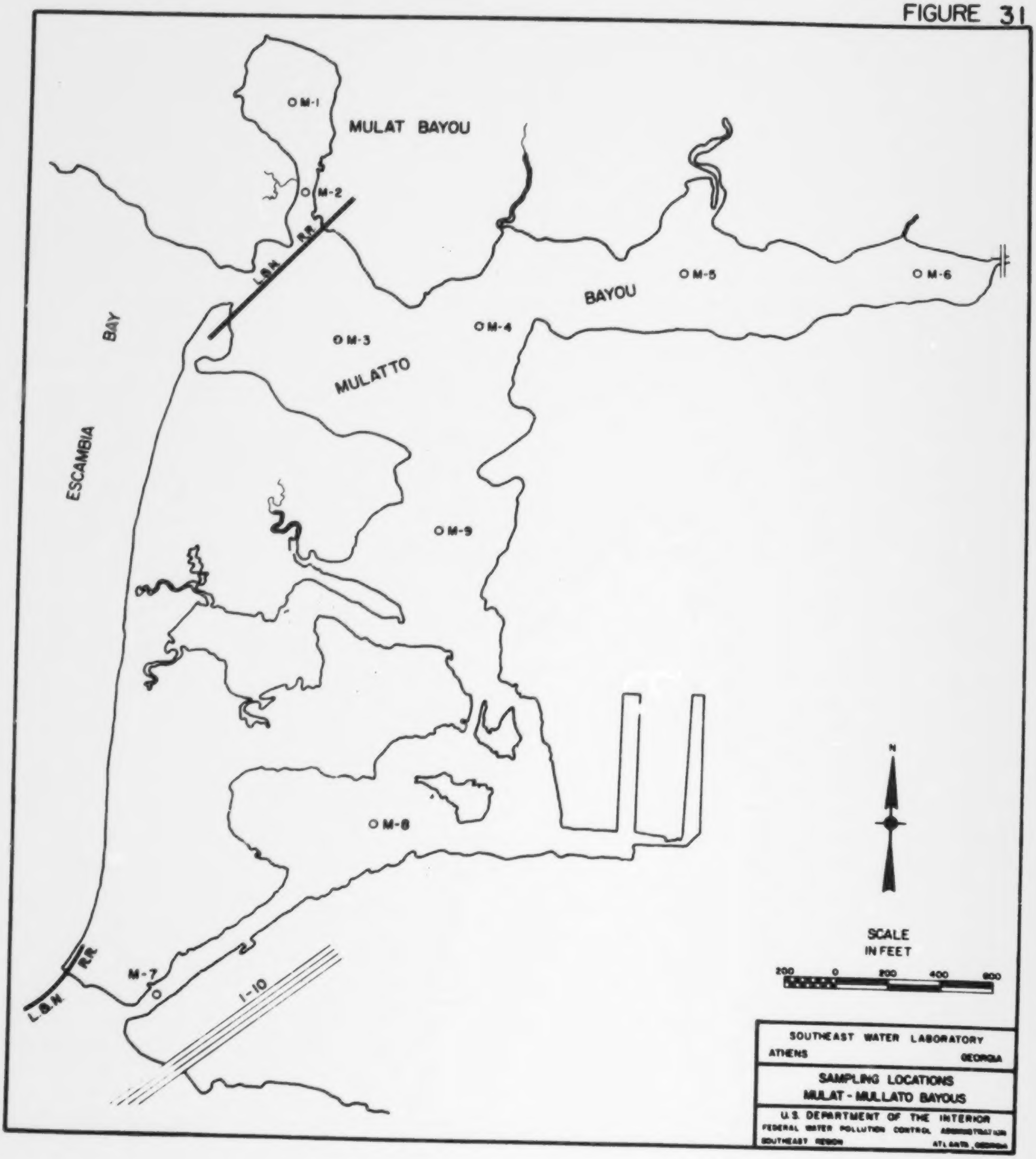
The lower section of the bay south of the L & N railroad bridge is also in a degraded state due to sludge deposits. The only factor preventing an identical condition to upper Escambia Bay is the flushing and exchange of pollution out of the area in a relatively short period of time.

MULAT-MULATTO BAYOU

Many of the reported fish kills in 1969 occurred in Mulat-Mulatto Bayou on the eastern side of Escambia Bay. Within the past five years, a new opening to Escambia Bay, connecting to the southern arm of the Bayou, has been dredged. The bottom material removed was used as fill for the new I-10 bridge and in some sections, this new channel is more than twenty feet deep. This compares to an average depth, at low water, of about five feet in Escambia Bay off the bayou and about four feet in the bayou. Joining this new channel, a series of canals, dredged for a nearby residential area, have recently been constructed. These physical alterations have deleteriously affected the natural flushing and exchange of material from Mulat-Mulatto Bayou.

Water quality in Mulat-Mulatto Bayou is listed in Table 7 and the sampling locations are illustrated in Figure 31.

FIGURE 31


M-1
MULAT BAYOU
M-2
L&N R.R.
M-5
M-6
BAYOU
M-4
M-3
MULATTO
BAY
ESCAMBIA
M-9
M-8
N
SCALE
IN FEET
200
0
200
400
600
M-7
L&N R.R.
I-10

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

SAMPLING LOCATIONS
MULAT - MULLATO BAYOUS

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

Dissolved oxygen on the surface was between 8 to 10 mg/l with the highest values being observed in Mulat Bayou. These concentrations are greater than saturation and indicate excessive photosynthesis. At the four foot depth, DO was generally satisfactory at about 4 mg/l. However, in the borrow area, DO is completely absent below this depth. Furthermore, concentrations of total nitrogen and total phosphate at the 20 foot depth are ten to 20 times greater than in all other areas of the bayou.

The borrow area has become a settling basin for suspended organic material including algal organisms. The very high oxygen demand of this material has totally depleted DO and has turned this area into an anaerobic digester of organic wastes. During the ebbing current, this deoxygenated water and suspended and dissolved waste material is carried into Escambia Bay as previously discussed, and into the main section of Mulatto Bayou. The source of these organic deposits are: siltation from dredging of the canals for adjacent residential development; wastes from Escambia Chemical and American Cyanamid, (and, under certain current conditions, in lesser concentrations, Monsanto Company and Container Corporation) which come in through the northern entrance to Mulat-Mulatto Bayou; and deposits from dead algal and bacteria growths resulting from the excessive nutrient concentrations in the bayou.

Although Mulat-Mulatto Bayou is a desirable nursery area for sport fish, visual observation indicates that the entire bottom is covered with a thick organic ooze which emits a pronounced hydrogen sulfide odor when disturbed. Most of the bottom grasses, which are feeding grounds for fish, have been replaced by these sludge beds.

TABLE 7
WATER QUALITY - MULAT - MULATTO BAYOU
MEAN VALUES

STATION LOCATION	DEPTH FT.	Cl^-	D.O.	T.K.N.	AMMONIA-N mg/l	NO_2NO_3-N	TOTAL PO_4	ORTHO PO_4	TOTAL LIVE ALGAE CELLS/ml
M-1	1	11,900	7.9	1.52	0.39	< 0.008	0.165	0.032	-
M-2	2	11,500	5.9	0.71	0.10	< 0.006	0.094	0.039	-
M-3	1	11,200	6.8	0.76	0.15	< 0.007	0.082	0.032	1711
	4	11,900	6.1	0.79	0.03	0.010	0.045	0.035	-
M-4	1	11,450	8.2	0.99	0.26	< 0.005	0.074	0.033	-
	4	11,800	8.2	0.57	0.17	< 0.005	0.071	0.033	-
M-5	1	11,200	7.3	0.71	0.29	< 0.005	0.101	0.037	1052
	3	11,400	6.6	-	0.53	0.007	0.047	0.042	-
M-6	1	11,000	6.4	0.77	0.33	< 0.005	0.098	0.042	-
M-7	1	11,800	4.0	0.89	0.37	< 0.006	0.063	0.023	-
	5	13,000	3.8	0.47	0.12	0.005	0.052	0.019	-
M-8	1	12,600	7.7	0.73	0.09	< 0.009	0.045	0.032	-
	10	13,800	2.9	1.38	0.64	< 0.005	0.089	0.034	-
	20	14,400	0	11.50	10.90	< 0.005	0.930	0.095	-
M-9	1	12,100	7.2	1.60	0.56	0.009	0.130	0.035	1236

The combination of waste input; poor circulation caused by alteration of the natural physical configuration; and dredging practices are the major causes of the fish kills occurring in Mulat-Mulatto Bayou.

ESCAMBIA RIVER

1) Background

There have been numerous studies of the Escambia River by state and federal agencies and by industry. These reports and all data that were available for review are summarized as follows:

1. There has been an increase in color below the Container Corporation plant at Brewton, Alabama (11, 12, 13, 14). The color increase has been particularly pronounced since 1964-65 and is apparent a considerable distance into Florida (13, 14).

2. Total coliform levels were found to be elevated at stations below the junction of Murder and Conecuh Creeks and extending downstream to Highway 4 bridge at Century (11, 12, 15).

3. Slime growths attributable to wastes from Container Corporation are present in the river and in some years have been apparent as far downstream as Highway 4 bridge at Century (14, 16).

4. Studies of the aquatic biota have shown that the diversity and quality of the macro-invertebrate populations in a limited reach of river below the Container discharge are reduced.

The section of river in which the biota is appreciably affected has varied from year to year but has been generally restricted to the reach between Container discharge and the Alabama-Florida state line (14, 15, 16). The station at Highway 4 bridge near Century has been intensively studied for a period of over 10 years and, with the exception of 1961, the river at this station has supported a diverse and healthy community of aquatic macro-invertebrates (11, 12, 14, 15, 16, 17, 18, 19, 20). In 1961, a fish kill attributed to a spill of wood preservative chemical occurred and benthic studies at Century (16, 20) indicated a reduction in the quality and diversity of the fauna.

2) Water Quality and Biology

During the waste source survey and the biological survey conducted in September and October respectively, grab samples for the determination of dissolved oxygen (DO, pH, BOD, TOC, and color were collected at most of the river stations sampled (Appendix IV). Sample locations are described in Appendix II and and shown on Figure 3.

Dissolved oxygen was consistently high in the White River and at all Escambia River stations above the Monsanto outfall (C-1 through E-8 and W-11). At stations E-9, E-10, and E-12 below Monsanto the surface DO was high but in the deeper waters oxygen was depressed to level ranging from 1.5 mg/l to 3.2 mg/l.

Similar results were obtained by Hopkins (21) in studies conducted during the summer of 1969.

Color levels increase 40-50 units in the Conecuh River immediately below the Container Corporation outfall. These high levels are still apparent in the Escambia River at Century (Station E-5), but are reduced to near background at Highway 184 bridge (Station E-6) approximately 40 miles downstream.

The effect of waste sources on oxygen demand is demonstrated by the elevated biochemical oxygen demand (BOD) at Station C-1 (Brewton, Alabama STP), Station C-3 and C-5 (Container Corporation), and Station E-9 (Monsanto Chemical Corporation).

As discussed in the review of previous studies, the Escambia River at Highway 4 near Century, Florida, has been intensively studied for many years, and with the exception of a period in 1961 this station has supported a diverse community of organisms exceptionally rich in species.

In 1965, 1966, 1968, and 1969 the Federal Water Pollution Control Administration collected biological data at Century as part of a regional surveillance program. (Appendix VI) These data were collected by the placement of artificial substrate samplers (see Appendix II) for a period of 4 to 6 weeks during the period of low flow from July through September.

Biotic diversity (H) ranged from highs of 4.8 and 4.1 in 1965 and 1969, respectively, to lows of 3.1 and 2.4 during 1968 and 1966, respectively (Table 8). Equitability (E) was also high in 1965 and 1969 (mean of 0.74 and 0.65, respectively), but was severely reduced in 1966 and 1968 (mean of 0.26 and 0.41 respectively).

Diversity (H) is a function of both richness of species and equitability (E) or evenness in the distribution of individuals among the species. Richness of species in turn is primarily a function of the structural diversity of the habitat while equitaility provides a sensitive measure of subtle physical and/or chemical alterations of the aquatic habitat.

The levels of diversity (H) found during 1965 and 1969 at Century are comparable to levels of diversity found at surveillance stations studied in the southeastern United States where the waters are known to be of high quality. The diversity in 1966 and 1968

TABLE 8

DIVERSITY OF MACROINVERTEBRATE COMMUNITIES AS COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS FROM ESCAMBIA RIVER NEAR CENTURY, FLORIDA

SAMPLING INTERVAL	NUMBER OF SPECIES	NUMBER OF INDIVIDUALS	INDEX OF DIVERSITY (H)	EQUITABILITY COEFFICIENT (E)
10/21 - 11/18/65	38	324	4.12	0.68
10/21 - 11/18/65	42	185	4.31	0.69
10/21 - 11/18/65	62	569	4.82	0.68
10/21 - 11/18/65	45	224	4.78	0.91
06/23 - 08/18/66	38	955	3.42	0.39
06/23 - 08/18/66	48	2281	2.60	0.17
06/23 - 08/18/66	35	1182	2.61	0.23
06/23 - 08/18/66	27	1062	2.41	0.26
06/27 - 08/12/68	31	555	3.11	0.39
06/27 - 08/12/68	28	1047	3.06	0.43
08/04 - 09/10/69	32	234	3.79	0.59
08/04 - 09/10/69	29	144	3.34	0.52
08/04 - 09/10/69	33	180	4.12	0.79
08/04 - 09/10/69	23	95	3.47	0.70

found in other southeastern rivers which are known to be degraded by oxygen demanding wastes. Since the numbers of species found in 1966 and 1968 are comparable to those found in 1965 and 1969, the reduction in diversity must be a function of the equitability component.

Equitability levels below 0.50 have not been encountered in southeastern streams known to be unaffected by oxygen demanding wastes and in such streams "E" generally ranges between 0.6 and 0.8. From this standpoint, the biota in the Escambia River at Century during the periods of study in 1965 and 1969 were not degraded by wastes from upstream sources. In 1966 and 1968 the imbalance in the distribution of abundances of species is indicative of a degradation of the habitat at the time surveillance studies were conducted.

Flows during late summer in both 1966 and 1968 were much lower than normal. Flows during the time samples were in place were near 1,000 cfs and, in September 1968, the low flow of record was reported at the Century station. In 1965 flows at Century during the period of study ranged from 2,000 to 8,000 cfs, more than double the flow in 1966. Flow data were not available for the summer of 1969, but the dissolved oxygen as recorded by the monitor at Century was rarely below 5.0 mg/l and was never below 4.5 mg/l from July through September, 1969.

From July through September 1969, dissolved oxygen readings at Century, as recorded by an FWPCA automatic quality monitor, were never below 4.5 mg/l. An examination of the frequency distribution (at 0.5 mg/l intervals) of the dissolved oxygen values at Century as shown in Figures 32,33 and 34 indicate that levels were above 5.0 mg/l 82 percent, 90 percent, and 100 percent of the time during July, August, and September, respectively.

On October 22, 1969 qualitative samples of benthic macroinvertebrates were collected at Stations C-1 to C-5 from Brewton, Alabama, downstream to Century, Florida (Appendix V).

Numbers of species collected ranged from 25 to 37 at stations above Container Corporation to 29 and 30 species at the station below Container Corporation. Many species intolerant of depressed oxygen levels were collected at all stations sampled.

The diverse community of macroinvertebrates encountered at these stations are indicative of healthy stream conditions at the time of sampling and for a period of at least two to four weeks prior to the time of sampling.

For the reach of river immediately below the Container Corporation outfall (Station C-3 of this study), these data are somewhat at variance with the results of previous studies. It should be pointed out that the high flows which occurred in September 1969 completely resorted bottom materials, redistributed benthic organisms and would have tended to equalize the distribution of invertebrates throughout the entire reach of stream studied. During this period, dissolved oxygen levels were adequate to support a thriving community of benthic organisms.

FIGURE 32

HIGHWAY 4 BRIDGE ESCAMBIA R.
1600 JUL 7 THRU 0700 JUL 30

MIN TEMP 76.5

MAX TEMP 85.9

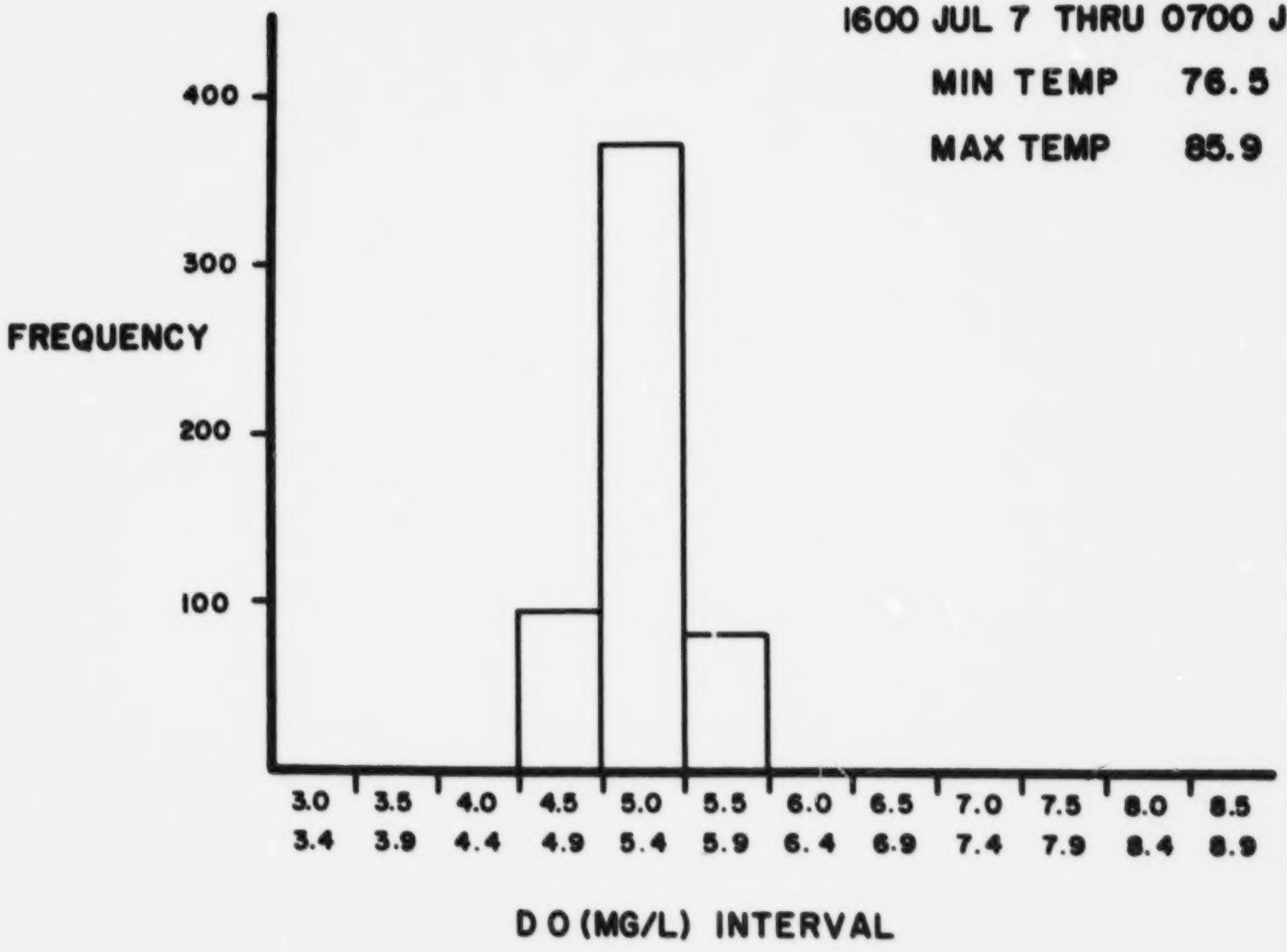


FIGURE 33

HIGHWAY 4 BRIDGE ESCAMBIA R.
1100 JUL 30 THRU 0900 SEP 4
MIN TEMP 78.4
MAX TEMP 87.0

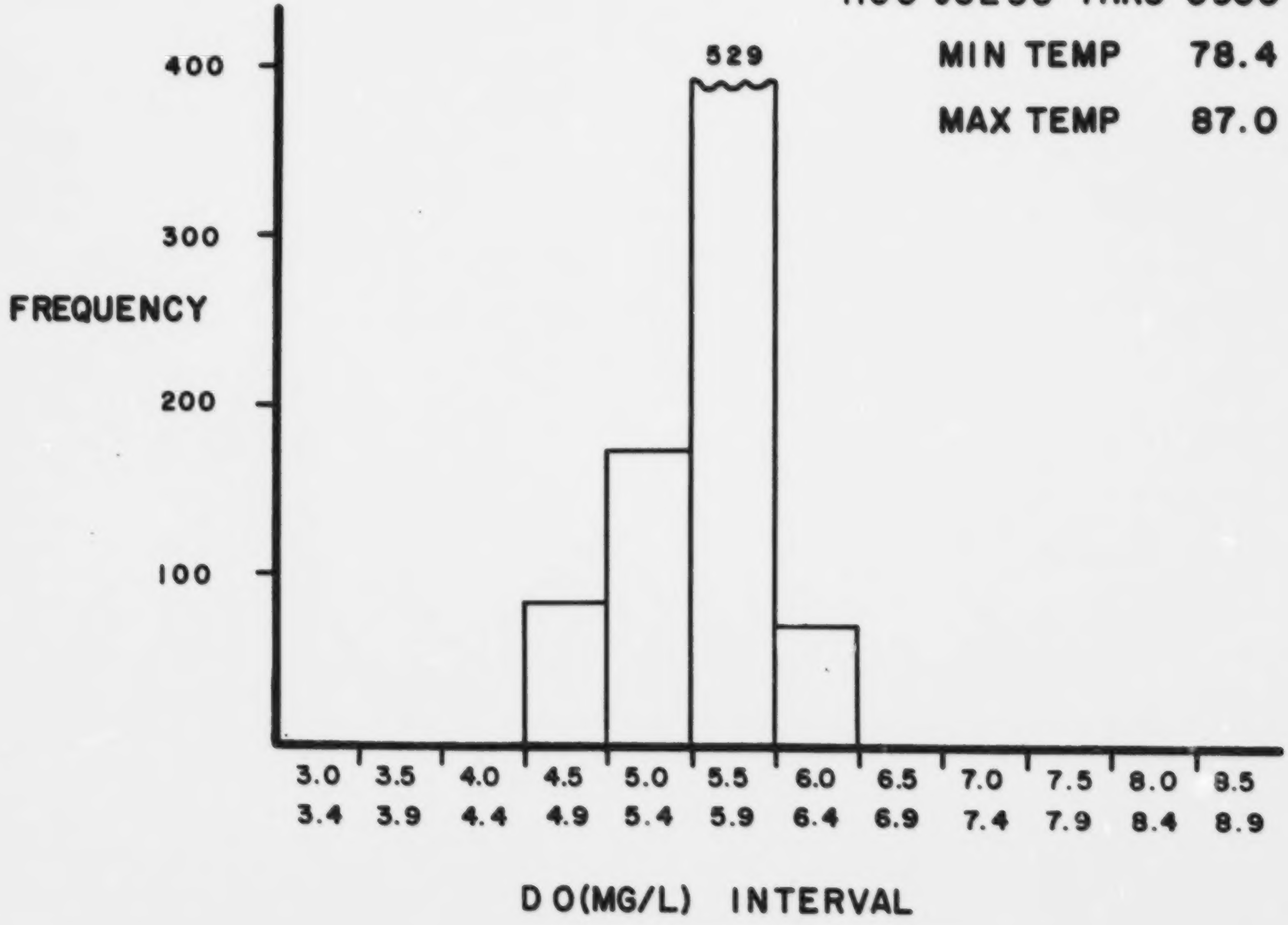


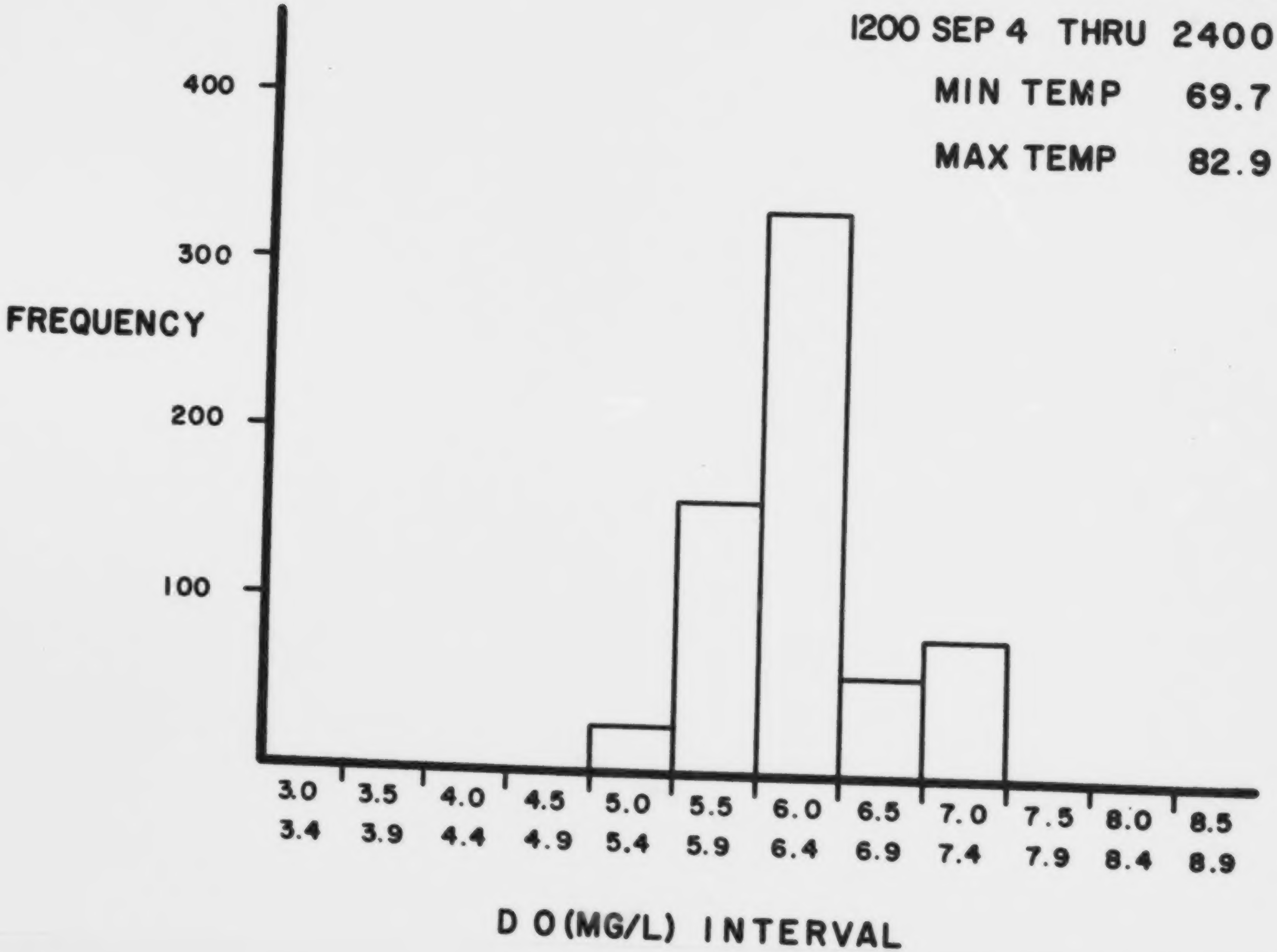
FIGURE 34

HIGHWAY 4 BRIDGE ESCAMBIA R.

1200 SEP 4 THRU 2400 SEP 30

MIN TEMP 69.7

MAX TEMP 82.9



52-C

VII. ABATEMENT

The present ecological imbalance of Escambia Bay and Mulat-Mulatto Bayou did not occur suddenly. The water quality degradation has developed over many years from discharging untreated and inadequately treated waste and from uncoordinated alteration of the bay's natural physical configuration, thereby adversely affecting flushing, exchange, and circulation. Restoration of water quality which will support a wide diversity of desirable water uses requires immediate adoption and enforcement of abatement regulations for all municipal and industrial polluters.

The carbon, nitrogen, and phosphorus discharges from Escambia Chemical Company, American Cyanamid Company, the Northeast sewage treatment plant of Pensacola, Monsanto Company, and Container Corporation of American should be reduced to levels that will not stimulate the excessive activity of floating algae and bacteria which is the major cause of the fish kills in the bay and in Mulat-Mulatto Bayou.

Recent literature reports have indicated that the availability of carbon dioxide is a major factor in accelerated eutrophication (22). The concentration of available carbon dioxide is a function of the carbonaceous material discharged from waste sources, uncontrollable inputs from land drainage and upstream river runoff, and from atmospheric diffusion. The concentration of carbon dioxide resulting from atmospheric diffusion will range from 0.4 to 1.0 mg/l. Because the uncontrollable inputs are highly variable, the contribution of carbon from artificial sources should not exceed the relatively constant input resulting from atmospheric diffusion. To maintain this level, the concentration of unstabilized carbon in Escambia Bay from artificial sources should not exceed 0.26 mg/l. The average TOC concentration in Escambia Bay is about 4 mg/l. This would require a minimum 94% reduction of carbonaceous material from all present and future waste sources.

The Monsanto Company should not discharge more than 605 pounds per day of five-day BOD nor more than 282 pounds per day to total organic carbon. Escambia Chemical should discharge no more than 17 and 12 pounds per day of five-day BOD and TOC respectively. Assuming that the primary treatment facilities remove 37% of the carbonaceous waste, American Cyanamid should discharge not more than 425 pounds per day of five-day BOD nor more than 500 pounds per day of TOC. Container Corporation of America and the Northeast sewage treatment plant presently remove about 80% of their carbonaceous waste. At a removal efficienty of 94%, Container Corporation should discharge not more than 2,230 pounds per day of five-day BOD nor more than 3,120 pounds per day of TOC. In the Escambia River between Brewton, Alabama, and Escambia Bay this waste effluent will be reduced an additional 80% by stabilization in the river. Therefore, the five-day BOD contribution from Container Corporation to Escambia Bay will be about 450 pounds per day. The Northeast sewage treatment plant effluent should contain not more than 137 pounds per day of five-day BOD nor more than 39 pounds per day of TOC.

The most important constituents of the nitrogen series which can be utilized quickly by algae are ammonia and nitrates. The

Wacasassa estuary in Florida which is unpolluted by artificial sources of waste has nitrate nitrogen concentrations of 0.03 mg/l (23). The average concentration of ammonia plus nitrite-nitrate nitrogen in Escambia Bay is 0.49 mg/l. Therefore, a reduction of at least 94% of nitrogen material is required from all present and future waste sources. Escambia Chemical Company effluent should contain no more than 197, 137, and 143 pounds per day of total Kjeldahl nitrogen, ammonia nitrogen, and nitrite-nitrate nitrogen respectively. American Cyanamid should discharge no more than 249, 32, and 42 pounds per day of TKN, ammonia nitrogen, and nitrite-nitrate nitrogen respectively. The TKN, ammonia nitrogen, and nitrite-nitrate nitrogen in the Monsanto effluent should not exceed 102, 66, and 80 pounds per day respectively. Container Corporation effluent should contain no more than 30 and 12 pounds per day of TKN and ammonia nitrogen. The Northeast sewage treatment plant should discharge no more than 101 and 84 pounds per day of TKN and ammonia nitrogen. The latter two polluters discharge negligible amounts of nitrite-nitrate wastes.

The amounts of phosphate required to stimulate algae blooms exceed about 0.01 mg/l in observed situations (22). The average concentration of total phosphorus in Escambia Bay is 0.09 mg/l. A 90% reduction of phsophorus material is required from all present and future waste sources. Escambia Chemical Company should be limited to 35 pounds per day each of total and ortho-phosphate. Monsanto Company should discharge not more than 46 and 29 pounds per day of total and ortho-phosphate. The Northeast sewage treatment plant effluent should not exceed 23 and 12 pounds per day, and

Container Corporation should discharge not greater than 17 and 8 pounds per day of total and ortho-phosphate. The American Cyanamid Company discharges a negligible amount of phosphate material.

All waste sources should provide complete removal of settleable solids.

If each waste source constructs individual treatment facilities to achieve the required reductions, more detailed studies of the circulation in Escambia Bay should be undertaken under a wider variation of fresh water inflow and tidal current movement. The results of these studies will determine optimal outfall locations and maximum dilution potential in the bay to prevent the unequal distribution of waste now occurring in the northern and eastern sections of Escambia Bay.

Individual waste treatment facilities for all present and future sources is one alternative to achieve the required 94%, 94%, and 90% reductions in carbonaceous, nitrogenous, and phosphorus material respectively. However, the residual amounts of nutrient material from artificial sources, in addition to natural sources such as land runoff, will still continue to be discharged to Escambia Bay. Accelerated eutrophication of the bay would continue, although at a substantially reduced and slower rate. The most desirable alternative would remove as close as possible to 100% of all nutrient discharges from artificial sources. This would effectively halt the process of accelerated eutrophication and would obviate the need for any circulation studies with respect to outfall locations.

The Escambia Bay area is developing rapidly on both the eastern and western shoreline, and increasing amounts of wastes will be discharged from future sources even with the recommended removal efficiencies for carbon, nitrogen, and phosphorus. Therefore, the most effective waste management program will provide for this future expansion and development by considering the problem as part of a metropolitan area planning concept.

The recommended alternative is the construction of a sewer interceptor collection system around the entire bay and in the Escambia River to the Monsanto Company. All domestic and industrial wastes would be treated at a central facility with discharge away from Escambia Bay after the recommended carbon, nitrogen, and phosphorus reductions have been accomplished. Container Corporation should meet the recommended effluent quantities through increased carbon and phosphorus removals at the plant location. This alternative would virtually eliminate the discharge of nutrients from artificial sources to Escambia Bay, partially control land runoff, and provide for future residential and industrial development.

Both Alabama and Florida require that materials producing color...resulting from municipal, agricultural, or industrial discharges that may cause deleterious effects shall not be present in the receiving waters. As has been discussed, there is a significant increase in color in the Escambia River from upstream to downstream of the Container Corporation of America waste discharge. This increased color persists to the Alabama-Florida state line. Levels of color in the Escambia River at the Alabama-Florida state line, as measured at the Highway 4 bridge near Century, Florida, should not exceed levels measured upstream of the Container Corporation waste discharge. At the present time, the Federal Water Pollution Control Administration is sponsoring several research and development grants to develop a technically and economically feasible process for color removal.

No further construction dredging should be permitted in Escambia Bay or Mulat-Mulatto Bayou until an area-wide plan for development of the shoreline has been established. At that time, construction dredging should be permitted only in accordance with this plan. This plan should be completed within one year by representatives of Escambia and Santa Rosa counties, the City of Pensacola, the State of Florida, the U. S. Army Corps of Engineers, and the U. S. Department of the Interior. Any necessary maintenance dredging in the interim should be conducted by diking the dredging area to prevent drifting of organic muds. Maintenance of existing channels should be accomplished by hydraulic pipeline dredging only. Disposal of all dredged material should be to upland site locations.

The L & N railroad trestle across Escambia Bay should be reconstructed by January 1, 1973, to eliminate the piling presently adversely affecting the circulation and exchange of water in the bay.

The American Cyanamid Company should reduce concentrations of acrylonitrile in its waste effluent to levels less than 10% of those which are toxic to fish.

The Monsanto Company and Gulf Power Company should by January 1, 1973, abate the excessive heat being discharged in their respective cooling water effluents.

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APPENDIX I
PROJECT PERSONNEL

A. Southeast Water Laboratory - FWPCA

Thomas P. Gallagher	Sanitary Engineer
Lawrence W. Olinger	Sanitary Engineer
Paul L. Wagner	Sanitary Engineer
Lee B. Tebo	Aquatic Biologist
Roy A. Whatley	Hydrologist
Donald A. Schultz	Aquatic Biologist
Paul Frey	Aquatic Biologist
Dennis T. Cafaro	Sanitary Engineer
R. Wade Knight	Chemist
Ray N. Hemphill	Chemist
Lavon H. Revells	Chemist
Thomas B. Bennett, Jr.	Chemist
Ralph E. Gentry	Microbiologist
Thomas N. Sargent	Sanitary Engineer
Jerry L. Dause	Sanitary Engineer
David R. Smith	Aquatic Biologist
Raymond T. Wilkerson	Technician
Roy A. Weimert	Technician
Ronald Sexton	Technician
Michael Swinford	Technician
Hoke Howard	Technician

B. University of West Florida Graduate Students

Nick Whiting
Stephen Howard
Dona Jarvis
Thomas Heitmuller
Andrew Auld
Rod Presnell

C. Alabama Water Improvement Commission

Mr. E. John Williford	Biologist

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Dr. Thomas Hopkins	University of West Florida
Mr. Wayne Tisdale	Florida Department of Health
Mr. Gordon Richmond	Florida Department of Health
Mr. Frank Skipper	Florida Department of A. & W. P. C.
Mr. William Young	Florida Department of A. & W. P. C.
Mr. Ted Ripsburger	Florida Department of A. & W. P. C.

APPENDIX II
SAMPLING PROCEDURES AND ANALYTICAL METHODS

I. PROCEDURES

A. Escambia Bay

The Escambia Bay field survey study was conducted at 6:00 a.m. on September 23rd to 6:00 p.m. on September 25th. Sampling runs began every six hours around-the-clock for the 60-hour period for a total of 10 complete runs. Each run took approximately two hours to complete.

Samples were collected at 28 pre-established bouy marker locations. The bouys were placed into position utilizing two standard surveying transits and employing triangulation techniques. Bouy 1 was placed in the mouth of the Escambia River near the shipping channel. Stations 2 through 24 were placed in a regular 3/4-mile grid pattern covering all of the Escambia Bay north and about 3/4 mile south of the L & N railway crossing. The grid pattern was laid out with bouys 19 to 21 forming the base line about 100 yards south of the L & N railroad trestle and Station 20 at the mid channel point. Stations 25 to 28 were in the shipping channel at one-mile intervals down the lower bay.

Samples were collected at one foot below the surface, one foot above the bottom, and at mid-depth. Stations located in water less than five feet deep were sampled at less than these three depths. In addition to DO, temperature, nitrogen series, TOC, pH, phosphorus series, and chlorides, plankton and mud samples were collected. DO, temperature, and chlorides were measured on each run at all of the 28 stations while samples for the remaining parameters were collected during the morning runs at 12 of these stations. Floating algae and mud samples were collected on one run only, during the first day.

B. Mulat-Mulatto Bayou

A special study of Mulat-Mulatto Bayou was conducted from 12:00 noon until 5:00 p.m. on September 19th. Two sample runs were made over the nine station route and grab samples were taken at each station using a Kemmerer sampler. Parameters measured included DO, temperature, pH, TOC, nitrogen series, phosphorus series, and chlorides. Floating algae samples were also collected at the one-foot level.

The sampling stations are as follows:

M-1 - Center of Mulat Bayou

M-2 - Mulat Bayou at McCmilan's Fish Camp

M-3 - Mulatto Bayou 200 yards west of L & N railroad tracks

M-4 - Mulatto Bayou near the junction of the two main arms

M-5 - Mulatto Bayou, eastern arm about ½ mile above junction

M-6 - Mulatto Bayou, eastern arm about ½ mile above junction

M-7 - Southern connector channel near I-10

M-8 - Borrow pool

M-9 - Mulatto Bayou, southern arm about ½ mile above junction

Samples were collected at one foot below the surface, one foot above the bottom, and at mid-depth. If the total depth was less than five feet, fewer than these three depths were sampled.

C. Waste Source Survey

Grab samples were collected from the effluents of the Monsanto Company, Container Corporation of America, Escambia Chemical Company, American Cyanamid Company, and the City of Pensacola Northeast sewage treatment plant. Sampling was conducted during the period September 10 through 20, 1969, at random times during all phases of the 24-hour production schedule. No notice of collection time was given to any of the waste sources other than the initial general contact. Between four and six samples were collected from each source.

Parameters analyzed included: five-day BOD, total organic carbon, nitrogen series, phosphorus series, and total and volatile solids. The effluents from Monsanto Company, Escambia Chemical, and American Cyanamid were examined by gas chromatography and mass spectrophotometry for complex organic chemicals.

D. Escambia River

The descriptions and locations of the stations are as follows:

C-1 - Conecuh River (river mile 7.8) upstream from the Alabama-Florida state line (Escambia

River mile 58.2) and slightly downstream from Container Corporation water intake and confluence of Murder Creek

C-2 - Conecuh River (river mile 4.3) upstream from Alabama-Florida state line and just upstream from Container Corporation outfall

C-3 - Conecuh River (river mile 2.3) upstream from Alabama-Florida state line at Pollard Landing downstream from Container Corporation outfall

BE-4 - Big Escambia Creek (river mile 2.0) at first bridge crossing upstream from confluence with Escambia River (river mile 50.2).

E-5 - Escambia River (river mile 48.8) at Florida Highway 4 bridge near Century, Florida

E-6 - Escambia River (river mile 13.5) at Florida Highway 184 bridge

E-7 - Escambia River (river mile 10.8) slightly upstream of upper confluence with White River near Ruth Patricks 1951 survey station P-1

E-8 - Escambia River (river mile 7.1) 0.4 mile upstream of Monsanto outfall

E-9 - Escambia River (river mile 6.3) 0.4 mile downstream from Monsanto outfall near Ruth Patricks 1951 survey station P-3

E-10- Escambia River (river mile 3.75) a short distance upstream from the lower confluence with White River near Ruth Patricks 1951 survey station P-4

W-11 - White River (river mile 2.2) upstream from lower confluence with Escambia River (river mile 3.6) and 200 feet upstream of gasline canal

E-12 - Escambia River (river mile 3.3) midway between Thompsons and Governors bayous

E-13 - Escambia River (river mile 2.6) near Coast Guard Bouy #26 slightly upstream of Gulf Power Company waste effluent ditch

E-14 - Escambia River (river mile 1.6) at U. S. Highway 90 bridge near Ruth Patricks 1951 survey station P-5

This mileage was computed from FWPCA 1968 map measurements. Zero mileage was set at Coast Guard Bouy #20 located in the main channel of the Escambia River mouth east of Riverview, Florida.

II. METHODS

A. Chemical Analyses

1. Total Kjeldahl Nitrogen (Automated Phenolate Method)

TKN is defined as the sum of free ammonia and organic nitrogen compounds which are converted to ammonia sulfate under the specified digestion conditions. The samples are automatically digested with a sulfuric acid solution containing potassium sulfate and mercuric sulfate as a catalyst to convert organic nitrogen to ammonium sulfate. The solution is then automatically neutralized with a sodium hydroxide solution and treated with alkaline phenol reagent and sodium hypochlorite reagent. This addition forms a blue color designated as indophenol. Sodium nitroprusside, which increases the intensity of the color, is added to obtain necessary sensitivity for measurement of low level nitrogen. The reaction color is measured at a wavelength of 630 . The TKN of the samples is compared against standards of urea carried through the entire procedure.

The bottom samples were digested by the manual method (12th Edition, Standard Methods) followed by pH adjustment and nitrogen analysis by the method below (2). The automated procedure for TKN is the SEWL standard method and appears in FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969.

2. Ammonia Nitrogen (Automated Method, FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

   Ammonia nitrogen is analyzed for its reaction with alkaline phenol hypochlorite. The intensity of the indophenol blue color which is formed is measured at 630 . Ammonium sulfate standards are used for calibration.

3. Total Nitrate-Nitrite Nitrogen (Automated Cadmium Reduction Method, FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

   This method is used to determine nitrates and nitrites singly or combined. The initial step of the procedure is to reduce nitrates to nitrites by using a cadmium-copper reduction column. The nitrites are then diazotized and coupled to form the azo dye. The dye intensity of both samples and standards is then measured at a wavelength of 540 .

4. Phosphorus (Automated Ascorbic Acid Method, FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

Phosphorus is reacted with ammonium molybdate and potassium antimonyl tartrate to form an antimony-phosphate-molybdate complex. This complex is reduced to an intensly blue colored complex by ascorbic acid. The color is proportional to the phosphorus concentration. The total phosphorus analysis on the water and bottom samples was carried out by this procedure preceeded by acid persulfate digestion.

5. Total Organic Carbon (FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

A micro sample of water is injected into a catalytic combustion tube heated to 950° C. The carbonaceous material is oxidized to carbon dioxide. An oxygen stream carries the CO_2 to an infrared analyzer sensitized to provide a measure of CO_2. The amount of CO_2 present is directly proportional to the concentration of carbonaceous material in the injected sample. The instrument used for this analysis is the Beckman Carbonaceous Analyzer, Model No. 915, dual channel.

6. Chemical Oxygen Demand (FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

   Organic materials in water samples are oxidized by potassium dichromate solution in 50% sulfuric acid. The excess dichromate is titrated with standard ferrous ammonium sulfate using ferroin as an indicator. The amount of dichromate used in the oxidation is proportional to the amount of organic and oxidizable inorganic matter in the sample. This procedure was used for analyzing both water and mud samples.

7. Chlorides (Automated Ferricyanide Method, FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969)

   Thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by chloride ion to form unionized mercuric chloride. In the presence of ferric ion, the liberated thiocyanate forms highly colored ferric thiocyanate, in concentration proportional to the original chloride concentration.

8. Biochemical Oxygen Demand, Total Solids, Total Volatile Solids, and Color

   These analyses were all carried out by the procedures outlined in Standard Methods for the Examination of Water and Waste Water, 12th Edition, 1965.

B. Biological Methods - Escambia River

Data on the aquatic macro-invertebrates were collected with artificial substrate samplers and by qualitative hand collections.

The artificial substrate samplers used were wire baskets containing 1½' to 3" diameter crushed limestone as described by Mason, et. al. (1967)(1). Three replicate samplers were submerged at a depth of three feet at Station E-5. After four to six weeks exposure the samplers were retrieved, the organisms removed and preserved in labled vials of 70% ethyl alcohol. The utility of these samplers lies in the fact that they provide a uniform substrate for quantitative comparisons of the kinds and numbers of organisms which are found at the different stations.

Data from these samplers were used to calculate indices of diversity using information theory techniques. There are two components of species diversity:

1. richness of species and
2. equitability in the distribution of individuals among the species.

Diversity was calculated using the Shannon-Wiener function:

$$H = - \sum_{r=1}^{s} P_r \log_2 P_r$$

Where H = mean diversity per individual, P = proportion of individuals belonging to the r^{th} species and s = number of species.

Equitability (E) was calculated by the method of Lloyd and Ghelardi (1964)(2).

"H", as calculated, is a combined measure of richness of species and equitability of distribution of these species in the sample while "E" is a measure of the equitability of distribution of these species in the sample while "E" is a measure of the equitability or evenness of distribution of species. As calculated, "E" and "H" may range in value from zero to one, and from zero to 3.321928 log N respectively (N = total number of individuals).

Diversity serves as an excellent objective measure of environmental disturbance because any physical or chemical alteration in the aquatic habitat tends to favor certain species while reducing or eliminating those species which would normally be present under undisturbed conditions.

Richness of species is a measure of the structural diversity of the habitat and except under conditions of extreme degradation (anoxic conditions, toxic materials, lethal temperatures) is often relatively insensitive to subtle environmental changes. Equitability (E) or evenness of distribution of individuals among the species is a sensitive measure of the stability of the physical and chemical characteristics of the habitat.

By using a uniform substrate, differences in diversity and equitability resulting from the physical structure of the habitat are kept to a minimum; hence reductions in these indices, particularly "E", may be attributed to differences in the chemical (oxygen levels, pH, alkalinity, etc.) and/or physical (temperature, turbidity, etc.) characteristics of the aquatic environment.

Qualitative collections were made by examining rocks, vegetation, and debris and hand picking all macroinvertebrates which could be found. This method of sampling provides a qualitative estimate of the richness of species and was used because the artificial substrate samplers available could not be used for sampling the shallow waters of the upper reaches of the river.

C. Water Quality Monitor - Century, Florida

A four parameter Schneider water quality monitor was placed in operation on the Escambia River at Century during June 1969. This instrument measures DO, temperature, pH, and conductivity and was constructed on the basis of Federal Water Pollution Control Administration specifications which for dissolved oxygen require an accuracy of ± 0.24 ppm.

The monitor is serviced weekly by personnel from the Florida Department of Air and Water Pollution Control and monthly by personnel from the Southeast Water Laboratory of the Federal Water Pollution Control Administration. At each servicing, prior to cleaning of the sensors, the dissolved oxygen reading is checked against a chemical determination using the Sodium Azide modification of the Winkler technique as described in Standard Methods for the Examination of Water and Waste Water, 12th Edition. Any difference between the monitor reading and the Winkler determination is reported as a plus or minus correction factor and the data adjusted accordingly.

REFERENCES

1. Mason, William T., Jr.; Anderson, J. B.; and Morrison, George E.; A Limestone-Filled, Artificial Substrate Sampler-Float Unit for Collecting Macroinvertebrates from Large Streams; Prog. Fish. Cult. 29(2):74; 1967.

2. Lloyd, Monte and Ghelardi, R. J.; A Table for Calculating the "Equitability" Component of Species Diversity; Journ. Anim. Ecol. 33:217-225; 1964.

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E01S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1250	01.0	25.3	05.8	072.2	04650	-	-	-	-	-	-
09/23/69	1820	-	25.0	05.1	-	03020	-	-	-	-	-	-
09/24/69	0035	-	25.0	04.4	-	06190	-	-	-	-	-	-
09/24/69	0045	01.0	23.0	04.9	057.8	03280	-	-	-	-	-	-
09/24/69	1315	01.0	25.0	05.8	071.0	03400	-	-	-	-	-	-
09/24/69	1800	-	28.0	05.1	-	13250	-	-	-	-	-	-
09/25/69	0640	01.0	22.3	05.3	061.4	02720	0.26	.14	.144	0.050	0.037	-
09/25/69	0820	-	24.0	04.9	-	-	-	-	-	-	-	-
09/25/69	1345	-	25.0	05.7	-	01450	-	-	-	-	-	-

STATION NO. E01M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1250	07.5	24.8	03.6	047.2	10950	-	-	-	-	-	-
09/23/69	1820	-	25.0	03.6	-	08010	-	-	-	-	-	-
09/24/69	0035	-	25.0	04.1	-	07520	-	-	-	-	-	-
09/24/69	0045	05.5	23.0	03.5	042.7	06800	-	-	-	-	-	-
09/24/69	1315	07.0	24.5	02.4	031.9	12900	-	-	-	-	-	-
09/24/69	1800	-	25.0	03.5	-	07500	-	-	-	-	-	-
09/25/69	0640	06.0	22.5	04.8	057.5	05950	0.37	.15	.094	0.055	0.033	05
09/25/69	0820	-	24.0	05.6	-	-	-	-	-	-	-	-
09/25/69	1345	-	24.0	05.3	-	05700	-	-	-	-	-	-

STATION NO. E01B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0630	15.0	24.0	03.4	045.7	14700	0.37	.18	.016	0.066	0.042	03
09/23/69	1250	15.0	24.5	01.7	022.8	13780	-	-	-	-	-	-
09/23/69	1820	-	25.0	02.8	-	11190	-	-	-	-	-	-
09/24/69	0035	-	25.0	05.1	-	11900	-	-	-	-	-	-
09/24/69	0045	10.0	23.5	01.8	023.7	13840	-	-	-	-	-	-
09/24/69	1315	12.0	24.5	01.8	024.1	13800	-	-	-	-	-	-
09/24/69	1800	-	25.0	02.5	-	01700	-	-	-	-	-	-
09/25/69	0640	12.0	23.3	02.5	033.2	14910	0.33	.19	.031	0.047	0.029	04
09/25/69	0820	-	24.0	04.7	-	-	-	-	-	-	-	-
09/25/69	1345	-	24.0	04.4	-	09700	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E02S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0710	01.5	23.0	04.3	052.4	06680	-	-	-	-	-	-
09/24/69	1905	-	24.0	05.8	-	03600	-	-	-	-	-	-
09/25/69	0145	-	22.0	05.4	-	03550	-	-	-	-	-	-
09/25/69	1505	-	26.0	08.3	-	04050	-	-	-	-	-	-

STATION NO. E02M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1310	01.5	24.5	07.1	088.7	06460	-	-	-	-	-	-
09/23/69	1900	-	25.0	05.1	-	05230	-	-	-	-	-	-
09/24/69	0710	01.5	22.5	05.1	-	-	-	-	-	-	-	-
09/24/69	1330	01.5	25.0	06.9	086.2	07100	-	-	-	-	-	-
09/25/69	0650	01.5	22.5	03.8	046.5	08050	-	-	-	-	-	-

STATION NO. E02B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1900	-	25.0	-	-	-	-	-	-	-	-	-
09/24/69	1505	-	24.0	04.5	-	12400	-	-	-	-	-	-
09/25/69	0145	-	23.0	05.1	-	-	-	-	-	-	-	-

STATION NO. E03S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0710	01.0	23.5	04.8	059.4	07460	-	-	-	-	-	-
09/23/69	1345	01.0	24.5	04.2	053.9	09330	-	-	-	-	-	-
09/23/69	1915	-	25.0	05.3	-	06290	-	-	-	-	-	-
09/24/69	0725	01.0	22.5	04.6	-	-	0.46	.24	.068	0.150	0.024	03
09/24/69	1335	01.0	25.0	07.3	095.3	10150	-	-	-	-	-	-
09/24/69	1900	-	23.0	05.5	-	07700	-	-	-	-	-	-
09/25/69	0145	-	24.0	04.6	-	10600	-	-	-	-	-	-
09/25/69	0700	01.0	23.0	03.7	046.3	10520	2.38	.68	.057	0.048	0.016	07
09/25/69	1455	-	27.0	06.3	-	10750	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E03M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1915	-	25.0	-	-	-	-	-	-	-	-	-
09/25/69	1455	-	27.0	10.3	-	12300	-	-	-	-	-	-

STATION NO. E03B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0715	05.0	23.5	02.5	031.9	10500	0.51	.29	.041	0.125	0.036	03
09/23/69	1345	05.0	24.5	02.5	032.4	10480	-	-	-	-	-	-
09/23/69	1915	-	25.0	08.6	-	07460	-	-	-	-	-	-
09/24/69	0725	05.0	23.0	02.6	033.2	11510	0.47	.24	.034	0.057	0.029	03
09/24/69	1335	05.0	24.8	07.7	101.4	11300	-	-	-	-	-	-
09/24/69	1900	-	25.0	05.7	-	11650	-	-	-	-	-	-
09/25/69	0140	-	24.0	04.8	-	12700	-	-	-	-	-	-
09/25/69	0700	03.0	23.2	04.3	054.4	10280	0.47	.02	<.005	0.039	0.007	20

STATION NO. E04S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1340	01.0	25.0	04.8	063.1	10850	-	-	-	-	-	-
09/23/69	1950	-	25.0	05.8	-	10880	-	-	-	-	-	-
09/24/69	0740	01.0	23.0	05.0	061.8	08230	-	-	-	-	-	-
09/24/69	1345	01.0	25.0	03.0	040.5	13550	-	-	-	-	-	-
09/24/69	1855	-	25.0	04.3	-	13650	-	-	-	-	-	-
09/25/69	0135	-	22.0	06.6	-	12000	-	-	-	-	-	-
09/25.69	0715	01.0	23.8	05.5	071.6	11960	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E04M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1950	-	25.0	-	-	-	-	-	-	-	-	-
09/25/69	0715	03.0	23.5	05.9	075.7	11010	-	-	-	-	-	-
09/25/69	1445	-	25.0	04.0	-	14600	-	-	-	-	-	-

STATION NO. E04B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0735	05.0	23.5	01.7	021.5	09720	-	-	-	-	-	-
09/23/69	1340	05.0	24.5	04.7	059.0	07080	-	-	-	-	-	-
09/23/69	1950	-	25.0	03.9	-	10390	-	-	-	-	-	-
09/24/69	0740	05.0	23.0	04.3	055.2	11970	-	-	-	-	-	-
09/24/69	1345	05.0	24.8	03.4	045.7	13450	-	-	-	-	-	-
09/24/69	1855	-	23.0	01.2	-	14000	-	-	-	-	-	-
09/25/69	0135	-	23.0	05.8	-	13100	-	-	-	-	-	-
09/25/69	0715	05.0	23.5	05.7	073.6	11710	-	-	-	-	-	-
09/25/69	1445	-	25.0	03.7	-	14700	-	-	-	-	-	-

STATION NO. E05S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	2200	-	24.0	05.4	-	05620	-	-	-	-	-	-
09/24/69	1910	-	24.0	06.1	-	05050	-	-	-	-	-	-
09/25/69	0155	-	22.0	05.0	-	03600	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E05M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0745	01.5	23.5	05.1	062.7	06700	0.39	.14	.094	0.070	0.029	03
09/23/69	1400	01.5	25.0	04.2	055.0	10460	-	-	-	-	-	-
09/24/69	0755	01.5	23.0	03.6	043.8	06680	-	-	-	-	-	-
09/24/69	1355	01.5	25.0	05.7	071.5	06000	-	-	-	-	-	-
09/25/69	0155	-	23.0	06.2	-	08900	-	-	-	-	-	-
09/25/69	0730	01.5	23.0	04.7	058.1	08240	-	-	-	-	-	-
09/25/69	1510	-	24.0	07.5	-	11400	-	-	-	-	-	-

STATION NO. E05B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	2200	-	24.0	04.8	-	06870	-	-	-	-	-	-
09/24/69	1910	-	25.0	04.4	-	11700	-	-	-	-	-	-
09/25/69	0155	-	23.0	03.3	-	12800	-	-	-	-	-	-

STATION NO. E06S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0800	01.0	23.5	02.9	035.8	07350	-	-	-	-	-	-
09/23/69	1410	01.0	24.5	06.4	081.9	08940	-	-	-	-	-	-
09/23/69	2220	-	25.0	06.3	-	-	-	-	-	-	-	-
09/24/69	0810	01.0	23.0	05.6	-	-	-	-	-	-	-	-
09/24/69	1400	01.0	25.5	09.3	123.4	10900	-	-	-	-	-	-
09/24/69	1920	-	24.0	07.4	-	07350	-	-	-	-	-	-
09/25/69	0200	-	21.0	05.8	-	04500	-	-	-	-	-	-
09/25/69	0740	01.0	23.5	06.4	081.3	10100	-	-	-	-	-	-
09/25/69	1515	-	27.0	10.2	-	03100	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E06M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1410	03.0	24.5	07.0	089.9	09330	-	-	-	-	-	-
09/23/69	2220	-	25.0	05.6	-	-	-	-	-	-	-	-
09/24/69	0810	03.0	23.0	04.8	-	-	-	-	-	-	-	-
09/24/69	1400	03.0	25.2	09.4	125.0	11600	-	-	-	-	-	-
09/24/69	1920	-	24.0	07.7	-	11600	-	-	-	-	-	-
09/25/69	0200	-	23.0	06.9	-	12200	-	-	-	-	-	-
09/25/69	0740	03.0	23.5	06.4	081.9	10850	-	-	-	-	-	-
09/25/69	1515	-	25.0	04.5	-	11600	-	-	-	-	-	-

STATION NO. E06B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0800	05.0	23.5	02.9	037.1	10920	-	-	-	-	-	-
09/23/69	1410	05.0	24.5	03.5	046.0	11740	-	-	-	-	-	-
09/23/69	2220	-	25.0	04.2	-	10980	-	-	-	-	-	-
09/24/69	0810	05.0	23.5	01.8	023.7	13820	-	-	-	-	-	-
09/24/69	1920	-	24.0	03.0	-	14200	-	-	-	-	-	-
09/25/69	0200	-	24.0	06.0	-	11900	-	-	-	-	-	-
09/25/69	0740	05.0	23.0	04.9	062.1	10840	-	-	-	-	-	-
09/25/69	1515	-	25.0	02.1	-	14700	-	-	-	-	-	-

STATION NO. E07S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0815	01.0	23.5	05.3	066.2	08430	2.59	.50	.169	0.467	0.315	05
09/23/69	1420	01.0	25.0	09.4	122.3	09730	-	-	-	-	-	-
09/23/69	1940	-	25.0	07.2	-	09510	-	-	-	-	-	-
09/24/69	0825	01.0	22.0	06.5	080.8	10580	2.55	.00	.165	0.348	0.232	03
09/24/69	1410	01.0	25.2	07.8	105.1	12900	-	-	-	-	-	-
09/24/69	1850	-	25.0	07.3	-	12650	-	-	-	-	-	-
09/25/69	0115	-	23.0	05.9	-	07000	-	-	-	-	-	-
09/25/69	0800	01.0	23.5	06.1	078.2	11000	0.56	.29	.143	0.060	0.020	06
09/25/69	1450	-	27.0	08.2	-	12900	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E07M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0815	03.0	23.5	05.5	069.6	09660	1.27	.80	.055	0.200	0.117	05
09/23/69	1420	03.0	25.0	06.4	083.3	09880	-	-	-	-	-	-
09/23/69	1940	-	25.0	08.7	-	10710	-	-	-	-	-	-
09/24/69	0825	03.0	22.5	06.0	075.2	10580	2.18	.45	.144	0.260	0.197	03
09/24/69	1410	03.0	25.0	07.5	100.7	12900	-	-	-	-	-	-
09/24/69	1850	-	25.0	07.6	-	13350	-	-	-	-	-	-
09/25/69	1450	-	26.0	04.6	-	14300	-	-	-	-	-	-

STATION NO. E07B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0815	05.0	23.5	03.3	042.3	11090	0.55	.32	.073	0.140	0.063	04
09/23/69	1420	05.0	24.5	05.9	077.4	11500	-	-	-	-	-	-
09/23/69	1940	-	25.0	03.7	-	12200	-	-	-	-	-	-
09/24/69	0825	05.0	23.5	01.3	017.0	13380	0.84	.45	.129	0.134	0.106	03
09/24/69	1410	05.0	24.8	06.6	089.0	13650	-	-	-	-	-	-
09/24/69	1850	-	24.0	04.6	-	13700	-	-	-	-	-	-
09/25/69	0115	-	24.0	06.6	-	11300	-	-	-	-	-	-
09/25/69	0800	05.0	23.5	01.0	013.2	14300	0.58	.41	.074	0.070	0.024	04
09/25/69	1450	-	25.0	05.3	-	14300	-	-	-	-	-	-

STATION NO. E08S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0835	01.0	23.5	06.3	078.9	08630	0.36	.14	.067	0.091	0.036	04
09/23/69	1430	01.0	24.8	06.5	083.5	08870	-	-	-	-	-	-
09/23/69	2100	-	25.0	09.2	-	09020	-	-	-	-	-	-
09/24/69	0835	01.0	22.0	07.7	093.6	08320	0.29	.06	.080	0.080	0.014	03
09/24/69	1430	01.0	24.5	10.3	130.8	08200	-	-	-	-	-	-
09/24/69	1820	-	25.0	11.8	-	08100	-	-	-	-	-	-
09/25/69	0015	-	24.0	07.5	-	07200	-	-	-	-	-	-
09/25/69	0845	01.0	23.5	08.8	110.0	08410	0.88	.06	.025	0.051	0.010	09
09/25/69	1410	-	27.0	09.2	-	07800	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E08M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0835	03.0	23.5	06.1	076.5	08750	0.38	.14	.054	0.082	0.024	04
09/23/69	1430	03.0	24.5	06.6	084.6	09180	-	-	-	-	-	-
09/23/69	2100	-	25.0	07.2	-	10590	-	-	-	-	-	-
09/24/69	0835	03.0	22.5	06.7	082.7	09000	0.31	.10	.071	0.066	0.015	03
09/24/69	1430	03.0	24.5	09.3	117.8	07900	-	-	-	-	-	-
09/24/69	1820	-	27.0	11.9	-	08300	-	-	-	-	-	-
09/25/69	0015	-	24.0	07.4	-	08900	-	-	-	-	-	-
09/25/69	0845	03.0	23.5	09.2	115.2	08580	0.43	.04	.052	0.030	0.007	17

STATION NO. E08B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0835	05.0	23.5	02.6	033.2	10760	0.51	.34	.017	0.176	0.113	04
09/23/69	1430	05.0	24.0	02.6	033.4	10330	-	-	-	-	-	-
09/23/69	2100	-	25.0	06.5	-	10510	-	-	-	-	-	-
09/24/69	0835	05.0	23.0	02.3	029.2	11120	0.34	.13	.055	0.070	0.020	03
09/24/69	1430	05.0	24.5	08.8	113.0	09300	-	-	-	-	-	-
09/24/69	1820	-	26.0	10.2	-	08600	-	-	-	-	-	-
09/25/69	0015	-	24.0	06.8	-	07550	-	-	-	-	-	-
09/25/69	0845	05.0	24.0	05.1	065.9	10930	0.35	.10	.037	0.056	0.014	06
09/25/69	1410	-	25.0	05.6	-	11900	-	-	-	-	-	-

STATION NO. E09S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1440	01.0	25.5	11.4	144.7	06320	-	-	-	-	-	-
09/23/69	2035	-	25.0	06.4	-	06940	-	-	-	-	-	-
09/24/69	0850	01.0	22.5	05.3	063.6	06030	0.36	.16	.124	0.050	0.022	03
09/24/69	1440	01.0	25.2	06.5	081.1	05050	-	-	-	-	-	-
09/25/69	0215	-	23.0	06.3	-	06000	-	-	-	-	-	-
09/25/69	0815	01.0	22.5	05.0	059.7	05590	0.22	.08	.135	0.029	0.010	07
09/25/69	1520	-	27.0	07.0	-	04000	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E09M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	2035	-	25.0	06.4	-	09280	-	-	-	-	-	-
09/24/69	0420	-	23.0	05.0	-	08200	-	-	-	-	-	-
09/25/69	0815	03.0	23.0	05.1	061.7	06070	0.39	.12	.145	0.088	0.075	07
09/25/69	1520	-	25.0	04.2	-	10500	-	-	-	-	-	-

STATION NO. E09B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0850	04.0	23.5	01.8	023.5	12980	-	-	-	-	-	-
09/23/69	2035	-	25.0	06.5	-	08790	-	-	-	-	-	-
09/24/69	0850	04.0	23.0	03.3	041.7	10440	0.31	.10	.058	0.049	0.026	03
09/24/69	1440	04.0	25.0	08.1	101.9	06300	-	-	-	-	-	-
09/24/69	1835	-	26.0	05.8	-	09000	-	-	-	-	-	-
09/25/69	0215	-	23.0	06.3	-	07200	-	-	-	-	-	-
09/25/69	0815	05.0	23.5	03.2	041.1	11320	0.40	.13	.071	0.075	0.018	10
09/25/69	1520	-	25.0	04.5	-	08450	-	-	-	-	-	-

STATION NO. E10S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	01.0	23.5	06.9	085.8	07840	0.44	.19	.094	0.108	0.031	04
09/23/69	1445	01.0	25.0	07.1	091.2	08510	-	-	-	-	-	-
09/23/69	2020	-	25.0	06.4	-	08220	-	-	-	-	-	-
09/24/69	0400	-	22.0	05.2	-	07350	-	-	-	-	-	-
09/24/69	0905	01.0	23.0	06.4	078.5	07820	0.44	.25	.102	0.050	0.029	06
09/24/69	1450	01.0	25.2	09.7	126.8	09900	-	-	-	-	-	-
09/24/69	1940	-	25.0	07.7	-	06550	-	-	-	-	-	-
09/25/69	0050	-	22.0	05.9	-	04550	-	-	-	-	-	-
09/25/69	0820	01.0	23.0	06.6	081.3	07900	0.35	.16	.085	0.042	0.020	06
09/25/69	1430	-	27.0	10.7	-	09250	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E10M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	04.5	23.5	06.6	082.5	08440	0.48	.18	.091	0.136	0.029	04
09/23/69	1445	04.5	24.5	07.4	095.1	09450	-	-	-	-	-	-
09/23/69	2020	-	25.0	06.6	-	08700	-	-	-	-	-	-
09/24/69	0905	04.5	23.0	06.0	074.8	09140	0.38	.09	.093	0.035	0.022	04
09/24/69	1450	04.5	25.0	08.5	112.2	11200	-	-	-	-	-	-
09/24/69	1840	-	25.0	09.4	-	08600	-	-	-	-	-	-
09/25/69	0050	-	24.0	07.5	-	09300	-	-	-	-	-	-
09/25/69	0820	04.0	23.5	07.0	088.9	10020	0.50	.17	.121	0.050	0.020	06

STATION NO. E10B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	08.0	23.5	02.9	038.0	13150	0.40	.17	.022	0.089	0.035	03
09/23/69	1445	08.0	24.5	03.6	047.7	12520	-	-	-	-	-	-
09/23/69	2020	-	25.0	04.4	-	13840	-	-	-	-	-	-
09/24/69	0905	08.0	23.5	03.1	041.0	14020	0.32	.12	.024	0.051	0.029	03
09/24/69	1450	08.0	24.6	05.6	075.4	13900	-	-	-	-	-	-
09/24/69	1840	-	25.0	03.1	-	15600	-	-	-	-	-	-
09/25/69	0050	-	24.0	04.9	-	11750	-	-	-	-	-	-
09/25/69	0820	07.0	23.7	03.2	042.7	14560	0.30	.01	<.005	0.394	0.010	09
09/25/69	1430	-	25.0	03.2	-	13900	-	-	-	-	-	-

STATION NO. E11S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1500	01.0	25.2	07.7	100.2	09400	-	-	-	-	-	-
09/23/69	2010	-	25.0	08.4	-	10160	-	-	-	-	-	-
09/24/69	0920	01.0	22.5	05.5	068.4	09740	-	-	-	-	-	-
09/24/69	1500	01.0	25.4	08.7	117.1	12500	-	-	-	-	-	-
09/24/69	1845	-	25.0	10.1	-	11950	-	-	-	-	-	-
09/25/69	0100	-	22.0	05.6	-	04600	-	-	-	-	-	-
09/25/69	0830	01.0	23.5	05.6	072.4	11860	-	-	-	-	-	-
09/25/69	1440	-	27.0	10.0	-	11300	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E11M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0910	03.0	23.5	04.7	059.2	09260	-	-	-	-	-	-
09/23/69	1500	03.0	25.0	07.1	092.0	09330	-	-	-	-	-	-
09/23/69	2010	-	25.0	-	-	-	-	-	-	-	-	-
09/24/69	0410	-	22.0	06.0	-	05310	-	-	-	-	-	-
09/24/69	0920	03.0	22.5	04.3	053.7	10130	-	-	-	-	-	-
09/24/69	1500	03.0	25.2	07.9	106.1	12600	-	-	-	-	-	-
09/25/69	0830	03.0	23.5	05.3	068.3	11490	-	-	-	-	-	-

STATION NO. E11B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0910	05.0	23.5	02.0	025.7	11530	-	-	-	-	-	-
09/23/69	1500	05.0	24.8	04.2	053.5	08030	-	-	-	-	-	-
09/23/69	2010	-	25.0	08.3	-	09890	-	-	-	-	-	-
09/24/69	0920	05.0	23.5	03.0	038.9	12250	-	-	-	-	-	-
09/24/69	1500	05.0	25.2	07.5	101.2	13100	-	-	-	-	-	-
09/24/69	1845	-	24.0	05.6	-	13900	-	-	-	-	-	-
09/25/69	0100	-	23.0	06.3	-	07850	-	-	-	-	-	-
09/25/69	0830	05.0	23.3	04.5	057.7	11360	-	-	-	-	-	-
09/25/69	1440	-	24.0	04.6	-	13700	-	-	-	-	-	-

STATION NO. E12S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	01.0	24.0	07.1	088.9	07720	-	-	-	-	-	-
09/23/69	1510	01.0	25.0	07.3	093.1	07760	-	-	-	-	-	-
09/23/69	2110	-	25.0	08.0	-	08370	-	-	-	-	-	-
09/24/69	0935	01.0	23.0	06.9	084.9	07780	-	-	-	-	-	-
09/24/69	1515	01.0	25.0	10.3	132.4	08500	-	-	-	-	-	-
09/24/69	1815	-	25.0	08.8	-	07850	-	-	-	-	-	-
09/25/69	0010	-	23.0	05.9	-	05300	-	-	-	-	-	-
09/25/69	0850	-	23.3	06.2	-	08120	-	-	-	-	-	-
09/25/69	1405	-	27.0	08.3	-	06450	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E11M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0910	03.0	23.5	04.7	059.2	09260	-	-	-	-	-	-
09/23/69	1500	03.0	25.0	07.1	092.0	09330	-	-	-	-	-	-
09/23/69	2010	-	25.0	-	-	-	-	-	-	-	-	-
09/24/69	0410	-	22.0	06.0	-	05310	-	-	-	-	-	-
09/24/69	0920	03.0	22.5	04.3	053.7	10130	-	-	-	-	-	-
09/24/69	1500	03.0	25.2	07.9	106.1	12600	-	-	-	-	-	-
09/25/69	0830	03.0	23.5	05.3	068.3	11490	-	-	-	-	-	-

STATION NO. E11B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0910	05.0	23.5	02.0	025.7	11530	-	-	-	-	-	-
09/23/69	1500	05.0	24.8	04.2	053.5	08030	-	-	-	-	-	-
09/23/69	2010	-	25.0	08.3	-	09890	-	-	-	-	-	-
09/24/69	0920	05.0	23.5	03.0	038.9	12250	-	-	-	-	-	-
09/24/69	1500	05.0	25.2	07.5	101.2	13100	-	-	-	-	-	-
09/24/69	1845	-	24.0	05.6	-	13900	-	-	-	-	-	-
09/25/69	0100	-	23.0	06.3	-	07850	-	-	-	-	-	-
09/25/69	0830	05.0	23.3	04.5	057.7	11360	-	-	-	-	-	-
09/25/69	1440	-	24.0	04.6	-	13700	-	-	-	-	-	-

STATION NO. E12S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	01.0	24.0	07.1	088.9	07720	-	-	-	-	-	-
09/23/69	1510	01.0	25.0	07.3	093.1	07760	-	-	-	-	-	-
09/23/69	2110	-	25.0	08.0	-	08370	-	-	-	-	-	-
09/24/69	0935	01.0	23.0	06.9	084.9	07780	-	-	-	-	-	-
09/24/69	1515	01.0	25.0	10.3	132.4	08500	-	-	-	-	-	-
09/24/69	1815	-	25.0	08.8	-	07850	-	-	-	-	-	-
09/25/69	0010	-	23.0	05.9	-	05300	-	-	-	-	-	-
09/25/69	0850	-	23.3	06.2	-	08120	-	-	-	-	-	-
09/25/69	1405	-	27.0	08.3	-	06450	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E12M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	03.5	24.0	06.4	080.7	08340	-	-	-	-	-	-
09/23/69	1510	03.5	24.8	07.6	098.5	09720	-	-	-	-	-	-
09/23/69	2110	-	25.0	-	-	08600	-	-	-	-	-	-
09/24/69	0935	03.5	23.0	04.8	059.9	09140	-	-	-	-	-	-
09/24/69	1515	03.5	25.0	10.7	137.4	08400	-	-	-	-	-	-
09/24/69	1815	-	25.0	08.5	-	07900	-	-	-	-	-	-

STATION NO. E12B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	06.0	24.0	01.7	022.3	12640	-	-	-	-	-	-
09/23/69	1510	06.0	24.5	04.3	054.7	08460	-	-	-	-	-	-
09/23/69	2110	-	25.0	07.9	-	08530	-	-	-	-	-	-
09/24/69	0935	06.0	24.0	00.9	012.0	14190	-	-	-	-	-	-
09/24/69	1515	06.0	24.8	10.1	129.8	08900	-	-	-	-	-	-
09/24/69	1815	-	25.0	08.6	-	07900	-	-	-	-	-	-
09/25/69	0010	-	24.0	06.2	-	08700	-	-	-	-	-	-
09/25/69	0850	-	23.8	04.0	-	12310	-	-	-	-	-	-

STATION NO. E13S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	01.0	24.0	06.6	081.5	06270	0.40	.17	.102	0.066	0.028	04
09/23/69	1525	01.0	24.5	05.2	066.2	08440	-	-	-	-	-	-
09/23/69	2120	-	25.0	06.4	-	08560	-	-	-	-	-	-
09/24/69	0315	-	24.0	05.7	-	08870	-	-	-	-	-	-
09/24/69	0950	01.0	23.5	06.9	085.5	07550	0.28	.11	.093	0.062	0.022	03
09/24/69	1520	01.0	24.8	09.6	-	-	-	-	-	-	-	-
09/24/69	1805	-	26.0	08.5	-	08250	-	-	-	-	-	-
09/25/69	0005	-	24.0	08.1	-	07150	-	-	-	-	-	-
09/25/69	0910	-	23.8	05.7	-	08540	0.49	.05	.074	0.052	0.010	06
09/25/69	1400	-	27.0	10.0	-	07400	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E13M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	04.0	24.0	05.7	071.4	07740	0.44	.13	.086	0.077	0.026	05
09/23/69	1525	04.0	24.5	06.3	080.6	09020	-	-	-	-	-	-
09/23/69	2120	-	25.0	07.2	-	-	-	-	-	-	-	-
09/24/69	0315	-	23.0	04.4	-	09390	-	-	-	-	-	-
09/24/69	0950	04.0	23.5	06.6	081.8	07590	0.35	.11	.096	0.058	0.029	03
09/24/69	1520	04.0	24.8	08.9	113.4	08000	-	-	-	-	-	-
09/24/69	1805	-	25.0	06.9	-	09450	-	-	-	-	-	-
09/25/69	0005	-	25.0	08.3	-	07500	-	-	-	-	-	-
09/25/69	0910	-	23.6	05.2	-	08940	0.36	.14	.077	0.058	0.024	05

STATION NO. E13B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	07.0	24.0	02.8	037.4	14120	0.38	.18	.016	0.073	0.039	03
09/23/69	1525	07.0	24.5	02.6	034.9	13780	-	-	-	-	-	-
09/23/69	2120	-	25.0	06.1	-	10990	-	-	-	-	-	-
09/24/69	0315	-	23.0	03.1	-	17390	-	-	-	-	-	-
09/24/69	0950	07.0	24.0	02.0	025.4	09210	0.38	.20	.023	0.096	0.070	03
09/24/69	1520	07.0	24.8	05.5	-	-	-	-	-	-	-	-
09/24/69	1805	-	25.0	03.2	-	12750	-	-	-	-	-	-
09/25/69	0005	-	24.0	03.2	-	13900	-	-	-	-	-	-
09/25/69	0910	-	24.0	02.1	-	13520	0.28	.14	.025	0.030	0.012	04
09/25/69	1400	-	25.0	02.6	-	13900	-	-	-	-	-	-

STATION NO. E14S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1000	01.0	24.0	07.0	087.0	06920	-	-	-	-	-	-
09/23/69	1620	01.0	25.0	05.6	070.9	07060	-	-	-	-	-	-
09/23/69	2125	-	25.0	06.4	-	08600	-	-	-	-	-	-
09/24/69	0320	-	22.0	05.5	-	11500	-	-	-	-	-	-
09/24/69	1000	01.0	23.5	-	-	-	-	-	-	-	-	-
09/24/69	1530	01.0	25.4	09.6	122.2	06800	-	-	-	-	-	-
09/24/69	1825	-	24.0	06.2	-	06300	-	-	-	-	-	-
09/25/69	0915	-	24.0	08.3	-	09310	-	-	-	-	-	-
09/25/69	1415	-	28.0	06.3	-	03400	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E14M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1000	04.5	24.0	05.8	075.8	12030	-	-	-	-	-	-
09/23/69	1620	04.5	25.0	09.1	115.4	07130	-	-	-	-	-	-
09/23/69	2125	-	24.0	06.5	-	09470	-	-	-	-	-	-
09/24/69	0320	-	23.0	05.5	-	18100	-	-	-	-	-	-
09/24/69	1000	04.5	23.5	-	-	-	-	-	-	-	-	-
09/24/69	1530	04.0	25.1	09.6	122.9	07900	-	-	-	-	-	-
09/24/69	1825	-	24.0	08.3	-	09000	-	-	-	-	-	-
09/25/69	0020	-	24.0	06.6	-	08000	-	-	-	-	-	-
09/25/69	0915	-	24.5	07.0	-	11550	-	-	-	-	-	-
09/25/69	1415	-	25.0	10.9	-	08400	-	-	-	-	-	-

STATION NO. E14B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1000	08.0	24.0	03.1	041.6	14560	-	-	-	-	-	-
09/23/69	1620	08.0	24.5	04.0	053.6	13580	-	-	-	-	-	-
09/23/69	2125	-	25.0	04.6	-	13300	-	-	-	-	-	-
09/24/69	0320	-	23.0	03.2	-	20580	-	-	-	-	-	-
09/24/69	1000	08.0	24.0	03.8	050.9	14440	-	-	-	-	-	-
09/24/69	1530	08.0	24.8	07.6	100.9	12150	-	-	-	-	-	-
09/24/69	1825	-	24.0	05.9	-	13100	-	-	-	-	-	-
09/25/69	0020	-	24.0	06.2	-	09800	-	-	-	-	-	-
09/25/69	0915	-	24.0	02.6	-	15590	-	-	-	-	-	-
09/25/69	1415	-	25.0	08.8	-	10800	-	-	-	-	-	-

STATION NO. E15S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0700	01.0	23.0	08.2	101.1	07880	-	-	-	-	-	-
09/23/69	1615	01.0	25.0	06.1	078.7	08960	-	-	-	-	-	-
09/23/69	2150	-	25.0	05.7	-	10000	-	-	-	-	-	-
09/24/69	0335	-	22.0	05.5	-	09530	-	-	-	-	-	-
09/24/69	1000	01.0	23.5	06.7	084.1	08800	-	-	-	-	-	-
09/24/69	1540	01.0	25.0	09.8	129.6	11400	-	-	-	-	-	-
09/24/69	1630	-	27.0	10.1	-	11000	-	-	-	-	-	-
09/25/69	0030	-	23.0	06.1	-	05100	-	-	-	-	-	-
09/25/69	0905	01.0	24.0	06.4	080.6	08310	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E15S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/25/69	1420	-	28.0	10.3	-	09000	-	-	-	-	-	-

STATION NO. E15M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0700	05.0	23.0	06.1	079.6	13600	-	-	-	-	-	-
09/23/69	1615	03.5	25.0	07.0	090.3	08920	-	-	-	-	-	-
09/23/69	2150	-	25.0	04.5	-	-	-	-	-	-	-	-
09/24/69	1000	04.0	24.0	05.1	065.7	10580	-	-	-	-	-	-
09/24/69	1540	03.5	25.0	09.7	128.3	11400	-	-	-	-	-	-
09/24/69	1830	-	25.0	09.8	-	11500	-	-	-	-	-	-
09/25/69	0030	-	24.0	06.4	-	09900	-	-	-	-	-	-
09/25/69	0905	03.5	24.5	05.4	071.1	11910	-	-	-	-	-	-
09/25/69	1420	-	25.0	05.7	-	11400	-	-	-	-	-	-

STATION NO. E15B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0700	09.0	24.0	03.1	038.9	07960	-	-	-	-	-	-
09/23/69	1615	06.0	24.5	01.9	025.4	13[illegible]20	-	-	-	-	-	-
09/23/69	2150	-	24.0	05.8	-	11200	-	-	-	-	-	-
09/24/69	1000	07.0	25.0	02.2	030.2	15150	-	-	-	-	-	-
09/24/69	1540	06.0	24.5	07.5	101.7	14700	-	-	-	-	-	-
09/24/69	1830	-	24.0	04.6	-	14800	-	-	-	-	-	-
09/25/69	0030	-	23.0	04.3	-	12900	-	-	-	-	-	-
09/25/69	0905	06.0	25.0	02.5	034.7	16240	-	-	-	-	-	-
09/25/69	1420	-	25.0	05.6	-	13500	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E16S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0740	01.0	24.0	06.4	079.5	06790	-	-	-	-	-	-
09/23/69	1550	01.0	25.5	10.1	129.0	06940	-	-	-	-	-	-
09/23/69	1945	-	24.0	09.1	-	07860	-	-	-	-	-	-
09/24/69	0005	-	23.0	06.7	-	07700	-	-	-	-	-	-
09/24/69	0915	01.0	23.5	07.3	091.7	08870	-	-	-	-	-	-
09/24/69	1520	01.0	26.0	07.3	-	-	-	-	-	-	-	-
09/24/69	1752	-	25.5	10.5	-	06800	-	-	-	-	-	-
09/24/69	2350	-	24.5	07.5	-	07700	-	-	-	-	-	-
09/25/69	0845	01.0	24.5	07.2	092.0	08880	-	-	-	-	-	-
09/25/69	1520	01.0	26.0	09.7	124.9	06900	-	-	-	-	-	-

STATION NO. E16M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0740	04.5	24.0	06.4	080.0	07450	-	-	-	-	-	-
09/23/69	1550	03.0	25.0	09.6	121.7	07060	-	-	-	-	-	-
09/23/69	1945	-	24.0	07.9	-	09210	-	-	-	-	-	-
09/24/69	0005	-	23.0	06.6	-	07670	-	-	-	-	-	-
09/24/69	0915	03.0	24.5	06.9	088.2	08870	-	-	-	-	-	-
09/24/69	1520	03.0	25.5	09.5	121.5	07100	-	-	-	-	-	-
09/24/69	1752	-	25.5	09.7	-	07150	-	-	-	-	-	-
09/24/69	2350	-	25.0	05.4	-	10850	-	-	-	-	-	-

STATION NO. E16B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0740	08.0	25.0	03.3	044.4	13230	-	-	-	-	-	-
09/23/69	1550	05.0	25.0	03.1	041.8	13310	-	-	-	-	-	-
09/23/69	1945	-	24.0	06.2	-	10140	-	-	-	-	-	-
09/24/69	0005	-	23.5	04.9	-	09500	-	-	-	-	-	-
09/24/69	0915	05.0	25.0	03.5	047.4	13910	-	-	-	-	-	-
09/24/69	1752	-	25.0	02.6	-	14900	-	-	-	-	-	-
09/24/69	2350	-	25.0	02.6	-	12350	-	-	-	-	-	-
09/25/69	0845	05.0	25.0	02.0	027.6	15620	-	-	-	-	-	-
09/25/69	1520	05.0	25.5	01.6	022.0	14650	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E17S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0730	01.0	23.5	06.4	078.9	07040	-	-	-	-	-	-
09/23/69	1600	01.0	25.0	08.2	103.5	06610	-	-	-	-	-	-
09/23/69	1940	-	24.0	07.3	-	07230	-	-	-	-	-	-
09/24/69	0015	-	23.5	06.1	-	08080	-	-	-	-	-	-
09/24/69	0920	01.0	24.5	06.5	082.5	08150	-	-	-	-	-	-
09/24/69	1540	01.0	27.0	09.2	120.4	06800	-	-	-	-	-	-
09/24/69	1748	-	25.5	09.6	-	08300	-	-	-	-	-	-
09/24/69	2355	-	25.0	09.0	-	08850	-	-	-	-	-	-
09/25/69	0850	01.0	23.5	06.8	084.5	07810	-	-	-	-	-	-
09/25/69	1530	01.0	27.0	13.8	181.5	07300	-	-	-	-	-	-

STATION NO. E17M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0730	05.0	23.5	06.5	080.8	07860	-	-	-	-	-	-
09/23/69	1600	03.0	25.0	08.6	109.7	07760	-	-	-	-	-	-
09/23/69	1940	-	24.0	06.9	-	08030	-	-	-	-	-	-
09/24/69	0015	-	23.5	04.4	-	11130	-	-	-	-	-	-
09/24/69	0920	04.0	24.0	05.8	074.7	10580	-	-	-	-	-	-
09/24/69	1540	04.0	25.5	08.6	113.2	10050	-	-	-	-	-	-
09/24/69	1748	-	25.5	09.9	-	09600	-	-	-	-	-	-
09/24/69	2355	-	25.0	08.5	-	09100	-	-	-	-	-	-
09/25/69	0850	03.5	24.0	06.2	077.4	07350	-	-	-	-	-	-
09/25/69	1530	03.5	26.0	10.2	136.8	11050	-	-	-	-	-	-

STATION NO. E17B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0730	09.0	24.0	03.5	046.9	14490	-	-	-	-	-	-
09/23/69	1600	06.0	25.0	04.2	057.3	14580	-	-	-	-	-	-
09/23/69	1940	-	24.0	02.7	-	14350	-	-	-	-	-	-
09/24/69	0015	-	24.0	04.1	-	14030	-	-	-	-	-	-
09/24/69	1540	07.0	25.5	04.6	063.0	14100	-	-	-	-	-	-
09/24/69	1748	-	25.0	05.1	-	14350	-	-	-	-	-	-
09/25/69	0850	06.0	24.5	03.5	047.9	15510	-	-	-	-	-	-
09/25/69	1530	06.0	25.5	03.0	041.5	15000	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E18S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0715	01.0	24.0	06.6	083.0	08100	-	-	-	-	-	-
09/23/69	1610	01.0	25.5	11.0	142.5	08460	-	-	-	-	-	-
09/23/69	1955	-	24.0	07.3	-	-	-	-	-	-	-	-
09/24/69	0020	-	23.0	05.8	-	09260	-	-	-	-	-	-
09/24/69	0930	01.0	23.5	06.6	083.1	09140	0.73	.59	.129	0.068	0.025	04
09/24/69	1545	01.0	26.0	10.1	135.2	10900	-	-	-	-	-	-
09/24/69	1741	-	25.5	12.6	-	11900	-	-	-	-	-	-
09/25/69	0820	-	24.8	08.3	-	-	-	-	-	-	-	-
09/25/69	0855	01.0	24.5	07.5	097.6	10720	0.32	.06	.124	0.048	0.021	06
09/25/69	1540	01.0	27.0	11.8	160.3	10600	-	-	-	-	-	-

STATION NO. E18M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0715	04.5	24.0	06.6	083.0	08120	-	-	-	-	-	-
09/23/69	1610	03.0	25.0	06.5	085.9	11320	-	-	-	-	-	-
09/23/69	1955	-	24.0	07.1	-	-	-	-	-	-	-	-
09/24/69	0020	-	23.5	04.7	-	11980	-	-	-	-	-	-
09/24/69	0930	03.5	23.5	05.7	072.6	10390	0.57	.34	.124	0.069	0.019	04
09/24/69	1741	-	25.5	10.1	-	12000	-	-	-	-	-	-
09/25/69	0820	-	25.0	07.5	-	-	-	-	-	-	-	-

STATION NO. E19B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0715	08.0	24.0	03.2	042.2	13000	-	-	-	-	-	-
09/23/69	1610	05.0	25.0	05.6	074.7	12330	-	-	-	-	-	-
09/23/69	1955	-	24.0	06.8	-	09680	-	-	-	-	-	-
09/24/69	0020	-	24.0	03.7	-	14020	-	-	-	-	-	-
09/24/69	0930	06.0	24.5	03.3	044.6	14420	0.34	.04	.092	0.076	0.014	04
09/24/69	1545	05.0	25.0	05.3	072.0	14100	-	-	-	-	-	-
09/24/69	1741	-	25.0	09.9	-	13700	-	-	-	-	-	-
09/25/69	0820	-	25.0	03.7	-	-	-	-	-	-	-	-
09/25/69	0855	04.5	25.0	03.0	042.1	17150	0.32	.12	.029	0.033	0.021	03
09/25/69	1540	05.0	25.5	03.1	042.9	15000	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E19S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0955	01.0	24.0	07.3	092.3	08700	-	-	-	-	-	-
09/23/69	1520	01.0	25.0	09.9	125.3	06970	-	-	-	-	-	-
09/23/69	1925	-	24.0	07.1	-	09180	-	-	-	-	-	-
09/24/69	0035	-	23.0	07.6	-	07920	-	-	-	-	-	-
09/24/69	0850	01.0	23.5	07.3	092.3	09630	-	-	-	-	-	-
09/24/69	1455	01.0	25.0	09.4	119.8	07650	-	-	-	-	-	-
09/24/69	1758	-	25.5	09.4	-	07750	-	-	-	-	-	-
09/25/69	0010	-	25.0	09.7	-	08250	-	-	-	-	-	-
09/25/69	0820	01.0	24.5	06.8	086.7	08590	-	-	-	-	-	-
09/25/69	1510	01.0	28.0	09.4	130.4	05700	-	-	-	-	-	-

STATION NO. E19M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0955	04.0	24.5	06.9	088.1	08800	-	-	-	-	-	-
09/23/69	1925	-	24.0	07.3	-	09350	-	-	-	-	-	-
09/24/69	0035	-	23.0	05.5	-	07960	-	-	-	-	-	-
09/24/69	1758	-	25.5	09.6	-	07500	-	-	-	-	-	-
09/25/69	0010	-	25.0	09.4	-	08200	-	-	-	-	-	-

STATION NO. E19B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0955	07.0	25.0	03.8	051.3	13480	-	-	-	-	-	-
09/23/69	1520	04.0	25.5	05.5	073.0	10930	-	-	-	-	-	-
09/23/69	1925	-	24.0	05.6	-	10490	-	-	-	-	-	-
09/24/69	0035	-	23.5	03.5	-	11680	-	-	-	-	-	-
09/24/69	0850	04.0	24.0	03.3	044.1	14260	-	-	-	-	-	-
09/24/69	1455	04.0	25.0	08.4	108.7	09250	-	-	-	-	-	-
09/24/69	1758	-	25.0	05.8	-	13200	-	-	-	-	-	-
09/25/69	0010	-	25.0	04.9	-	13200	-	-	-	-	-	-
09/25/69	0820	04.0	25.5	02.0	028.2	16910	-	-	-	-	-	-
09/25/69	1510	04.0	25.5	03.4	047.0	15000	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E20S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0935	01.0	24.0	07.6	095.5	08080	0.47	.10	.098	0.062	0.013	04
09/23/69	1510	01.0	25.0	10.4	132.7	07760	-	-	-	-	-	-
09/23/69	1915	-	24.0	09.2	-	08000	-	-	-	-	-	-
09/24/69	0030	-	23.5	06.4	-	09190	-	-	-	-	-	-
09/24/69	0840	01.0	23.5	07.6	095.7	09120	0.41	.24	.097	0.138	0.017	04
09/24/69	1445	01.0	25.0	10.0	-	-	-	-	-	-	-	-
09/24/69	1802	-	25.8	09.5	-	07900	-	-	-	-	-	-
09/25/69	0015	-	25.0	08.1	-	08800	-	-	-	-	-	-
09/25/69	0810	01.0	24.0	06.8	086.1	08870	0.32	.07	.129	0.050	0.018	05
09/25/69	1500	01.0	28.0	11.0	146.9	07150	-	-	-	-	-	-

STATION NO. E20M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0935	06.5	24.5	06.5	085.3	11500	0.29	.08	.055	0.061	0.013	03
09/23/69	1510	06.5	25.5	06.5	087.6	12470	-	-	-	-	-	-
09/23/69	1915	-	24.0	05.2	-	13920	-	-	-	-	-	-
09/24/69	0030	-	23.5	05.4	-	12270	-	-	-	-	-	-
09/24/69	0840	05.0	24.0	05.5	071.8	11900	0.32	.16	.065	0.100	0.013	03
09/24/69	1802	-	25.4	06.1	-	13850	-	-	-	-	-	-
09/25/69	0015	-	25.0	06.8	-	09600	-	-	-	-	-	-
09/25/69	0810	04.0	24.5	05.8	074.3	09060	0.32	.08	.209	0.041	0.022	05
09/25/69	1500	05.0	26.0	07.9	108.4	13300	-	-	-	-	-	-

STATION NO. E20B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0935	12.0	25.0	06.2	084.9	14830	0.25	.11	.014	0.076	0.040	03
09/23/69	1510	12.0	25.0	03.2	041.9	15100	-	-	-	-	-	-
09/23/69	1915	-	24.0	04.4	-	14980	-	-	-	-	-	-
09/24/69	0030	-	24.0	03.8	-	15190	-	-	-	-	-	-
09/24/69	1445	09.0	25.0	04.0	-	-	-	-	-	-	-	-
09/24/69	1802	-	25.0	03.7	-	16100	-	-	-	-	-	-
09/25/69	0015	-	25.0	02.9	-	15750	-	-	-	-	-	-
09/25/69	0810	07.0	25.0	02.2	031.1	17840	0.39	.11	<.005	0.051	0.014	07
09/25/69	1500	09.0	25.5	02.1	029.3	15750	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E21S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	01.0	24.0	07.5	094.6	08390	-	-	-	-	-	-
09/23/69	1500	01.0	25.5	10.1	131.5	08970	-	-	-	-	-	-
09/23/69	1910	-	24.0	08.4	-	09080	-	-	-	-	-	-
09/24/69	0830	01.0	23.5	05.8	073.1	09340	-	-	-	-	-	-
09/24/69	1435	01.0	25.0	09.6	125.2	10000	-	-	-	-	-	-
09/24/69	1806	-	25.8	10.6	-	10550	-	-	-	-	-	-
09/25/69	0020	-	25.0	07.5	-	09400	-	-	-	-	-	-
09/25/69	0805	01.0	23.5	06.6	082.9	08890	-	-	-	-	-	-
09/25/69	1450	01.0	27.5	12.0	162.6	09500	-	-	-	-	-	-

STATION NO. E21M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	04.5	24.0	07.6	096.6	09160	-	-	-	-	-	-
09/23/69	1500	04.5	25.5	07.7	101.4	10160	-	-	-	-	-	-
09/23/69	1910	-	24.0	07.4	-	10820	-	-	-	-	-	-
09/24/69	0040	-	23.0	05.8	-	11200	-	-	-	-	-	-
09/24/69	1806	-	25.8	10.2	-	10800	-	-	-	-	-	-
09/25/69	0020	-	25.0	07.1	-	12850	-	-	-	-	-	-
09/25/69	0805	03.0	24.5	05.8	077.3	13120	-	-	-	-	-	-

STATION NO. E21B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0945	08.0	25.0	04.9	066.4	13820	-	-	-	-	-	-
09/23/69	1500	08.0	25.0	-	-	14500	-	-	-	-	-	-
09/23/69	1910	-	24.0	02.1	-	13520	-	-	-	-	-	-
09/24/69	0040	-	23.5	04.1	-	14480	-	-	-	-	-	-
09/24/69	0830	05.0	24.5	03.1	042.1	14880	-	-	-	-	-	04
09/24/69	1435	05.0	25.0	05.4	072.1	12350	-	-	-	-	-	-
09/24/69	1806	-	25.0	03.5	-	15400	-	-	-	-	-	-
09/25/69	0020	-	25.0	04.5	-	14950	-	-	-	-	-	-
09/25/69	0805	05.0	24.5	02.5	034.6	16840	-	-	-	-	-	-
09/25/69	1450	05.0	25.5	07.4	101.6	14200	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E22S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0915	01.0	23.5	07.8	098.5	09430	0.42	.03	.094	0.260	0.194	04
09/23/69	1540	01.0	25.5	09.9	126.8	07240	-	-	-	-	-	-
09/23/69	1855	-	24.0	08.3	-	08650	-	-	-	-	-	-
09/24/69	0110	-	23.0	07.7	-	09020	-	-	-	-	-	-
09/24/69	0820	01.0	24.0	07.7	099.0	10390	0.23	.07	.074	0.038	0.010	-
09/24/69	1505	01.0	25.5	10.0	129.9	08700	-	-	-	-	-	-
09/24/69	1820	-	25.3	09.0	-	08700	-	-	-	-	-	-
09/25/69	0042	-	24.8	08.9	-	08100	-	-	-	-	-	-
09/25/69	0830	01.0	24.0	07.9	099.9	08650	0.24	.05	.093	0.039	0.014	05
09/25/69	1515	01.0	26.0	11.2	145.5	07800	-	-	-	-	-	-

STATION NO. E22M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0915	05.0	24.0	07.6	096.9	09550	0.32	.04	.055	0.057	0.014	-
09/23/69	1540	03.0	25.5	09.5	122.7	08130	-	-	-	-	-	-
09/23/69	1855	-	24.0	07.3	-	11180	-	-	-	-	-	-
09/24/69	0110	-	23.0	07.8	-	08850	-	-	-	-	-	-
09/24/69	0820	03.0	24.0	07.3	094.3	10830	0.25	.04	.068	0.035	0.007	-
09/24/69	1505	03.0	25.5	09.9	128.3	08500	-	-	-	-	-	-
09/24/69	1820	-	25.2	05.3	-	13500	-	-	-	-	-	-
09/25/69	0042	-	25.0	04.0	-	14500	-	-	-	-	-	-
09/25/69	0830	03.0	24.0	07.9	100.2	08970	0.21	.02	.091	0.039	0.009	07

STATION NO. E22B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	1540	06.0	25.0	03.9	053.1	14330	-	-	-	-	-	-
09/23/69	1855	-	24.0	04.0	-	14920	-	-	-	-	-	-
09/24/69	0820	06.0	24.5	03.9	052.9	14780	0.21	.15	.020	0.031	0.016	-
09/24/69	1505	06.0	25.0	04.9	067.0	14700	-	-	-	-	-	-
09/24/69	1820	-	25.2	03.5	-	15000	-	-	-	-	-	-
09/25/69	0042	-	25.0	03.3	-	15450	-	-	-	-	-	-
09/25/69	0830	05.0	24.5	02.4	032.9	15960	0.26	.03	.017	0.027	0.012	06
09/25/69	1515	05.0	26.0	07.1	097.1	13050	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E23S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0925	01.0	24.0	07.8	099.1	09180	-	-	-	-	-	-
09/23/69	1430	01.0	25.0	09.8	126.3	08800	-	-	-	-	-	-
09/23/69	1845	-	24.0	08.9	-	09310	-	-	-	-	-	-
09/24/69	0100	-	22.5	06.6	-	09730	-	-	-	-	-	-
09/24/69	0810	01.0	23.5	06.7	084.7	09550	-	-	-	-	-	-
09/24/69	1415	01.0	25.0	09.9	129.0	09900	-	-	-	-	-	-
09/24/69	1815	-	25.8	10.3	-	09000	-	-	-	-	-	-
09/25/69	0030	-	25.0	08.5	-	08300	-	-	-	-	-	-
09/25/69	0745	01.0	24.0	06.9	087.5	08950	-	-	-	-	-	-
09/25/69	1435	01.0	27.5	11.4	151.1	07250	-	-	-	-	-	-

STATION NO. E23M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0925	06.5	24.0	06.1	080.2	12620	-	-	-	-	-	-
09/23/69	1430	06.5	25.0	07.8	103.7	11940	-	-	-	-	-	-
09/24/69	0100	-	23.0	06.5	-	10000	-	-	-	-	-	-
09/24/69	0810	06.0	24.5	06.4	086.4	14320	-	-	-	-	-	-
09/24/69	1415	06.0	25.0	05.4	074.5	15500	-	-	-	-	-	-
09/24/69	1815	-	25.2	04.5	-	13700	-	-	-	-	-	-
09/25/69	0030	-	25.0	07.2	-	11600	-	-	-	-	-	-
09/25/69	0745	05.5	25.0	03.7	051.4	16270	-	-	-	-	-	-
09/25/69	1435	06.0	25.5	04.7	064.9	14750	-	-	-	-	-	-

STATION NO. E23B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0925	12.0	24.5	05.1	069.7	15500	-	-	-	-	-	-
09/23/69	1430	12.0	25.5	05.0	069.6	15650	-	-	-	-	-	-
09/23/69	1845	-	24.0	04.5	-	15310	-	-	-	-	-	-
09/24/69	0100	-	23.5	04.1	-	14980	-	-	-	-	-	-
09/24/69	0810	11.0	24.5	03.4	046.7	16000	-	-	-	-	-	-
09/24/69	1415	11.0	25.5	04.0	056.3	16600	-	-	-	-	-	-
09/24/69	1815	-	25.0	04.2	-	16400	-	-	-	-	-	-
09/25/69	0030	-	25.0	04.5	-	15400	-	-	-	-	-	-
09/25/69	0745	10.0	25.0	02.5	035.1	17390	-	-	-	-	-	-
09/25/69	1435	11.0	25.5	02.2	030.8	16100	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E24S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	01.0	23.5	07.4	093.4	09460	0.76	.33	.119	0.166	0.049	05
09/23/69	1445	01.0	25.0	10.4	134.2	08930	-	-	-	-	-	-
09/23/69	1905	-	24.0	08.1	-	09420	-	-	-	-	-	-
09/24/69	0045	-	23.0	09.7	-	11830	-	-	-	-	-	-
09/24/69	1425	01.0	25.0	09.7	126.6	10100	-	-	-	-	-	-
09/25/69	0025	-	25.0	08.1	-	09450	-	-	-	-	-	-
09/25/69	0755	01.0	24.0	07.3	094.7	11260	0.50	.14	.005	0.026	0.032	24
09/25/69	1445	01.0	26.0	12.6	169.1	11100	-	-	-	-	-	-

STATION NO. E24M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	05.0	24.0	05.9	076.4	11120	0.36	.02	.048	0.037	0.005	07
09/23/69	1445	05.0	25.0	07.7	103.8	13290	-	-	-	-	-	-
09/23/69	1905	-	24.0	06.2	-	14100	-	-	-	-	-	-
09/24/69	0045	-	23.0	05.4	-	11860	-	-	-	-	-	-
09/24/69	1425	04.0	25.0	06.2	083.5	13200	-	-	-	-	-	-
09/24/69	1810	-	25.2	07.7	-	14400	-	-	-	-	-	-
09/25/69	0025	-	25.0	07.2	-	11900	-	-	-	-	-	-
09/25/69	0755	03.0	25.0	07.0	095.8	14750	0.40	.03	.061	0.046	0.019	08
09/25/69	1445	04.0	25.5	09.0	122.6	13500	-	-	-	-	-	-

STATION NO. E24B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0900	09.0	24.5	04.0	054.4	15020	0.21	.08	.010	0.053	0.020	03
09/23/69	1445	09.0	25.0	05.1	069.9	14990	-	-	-	-	-	-
09/23/69	1905	-	24.0	04.6	-	14710	-	-	-	-	-	-
09/24/69	0045	-	23.5	04.7	-	13490	-	-	-	-	-	-
09/24/69	1425	07.0	25.0	03.6	050.4	17000	-	-	-	-	-	-
09/24/69	1810	-	24.9	03.6	-	16000	-	-	-	-	-	-
09/25/69	0025	-	25.0	05.8	-	15000	-	-	-	-	-	-
09/25/69	0755	05.0	25.0	07.2	100.7	16810	0.46	.08	.009	0.042	0.199	05
09/25/69	1445	07.0	25.5	03.2	044.8	16150	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E25S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0845	01.0	23.5	05.3	067.3	10000	-	-	-	-	-	-
09/23/69	1410	01.0	25.0	11.2	144.7	09060	-	-	-	-	-	-
09/23/69	1830	-	24.0	08.7	-	08630	-	-	-	-	-	-
09/24/69	0120	-	23.0	06.7	-	10720	-	-	-	-	-	-
09/24/69	0800	01.0	23.0	07.4	093.9	10850	-	-	-	-	-	-
09/24/69	1405	01.0	25.0	09.6	125.6	10350	-	-	-	-	-	-
09/24/69	1827	-	25.3	11.3	-	09000	-	-	-	-	-	-
09/25/69	0050	-	25.0	10.4	-	09150	-	-	-	-	-	-
09/25/69	0740	01.0	23.5	07.4	091.8	07680	-	-	-	-	-	-
09/25/69	1425	01.0	26.5	11.5	151.5	08350	-	-	-	-	-	-

STATION NO. E25M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0845	07.5	24.5	03.6	048.1	13320	-	-	-	-	-	-
09/23/69	1410	07.5	25.0	09.9	135.1	14500	-	-	-	-	-	-
09/23/69	1830	-	24.0	09.1	-	09330	-	-	-	-	-	-
09/24/69	0120	-	23.5	04.7	-	10840	-	-	-	-	-	-
09/24/69	0800	06.5	24.0	05.9	078.3	13500	-	-	-	-	-	-
09/24/69	1405	05.5	25.0	07.5	101.4	13600	-	-	-	-	-	-
09/25/69	0050	-	25.0	08.0	-	09550	-	-	-	-	-	-
09/25/69	0740	04.5	24.5	04.6	061.1	12690	-	-	-	-	-	-
09/25/69	1425	04.5	26.0	11.6	151.3	08250	-	-	-	-	-	-

STATION NO. E25B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0845	14.0	25.0	02.9	040.1	15910	-	-	-	-	-	-
09/23/69	1410	14.0	25.0	05.6	075.6	13480	-	-	-	-	-	-
09/23/69	1830	-	24.0	07.7	-	12390	-	-	-	-	-	-
09/24/69	0120	-	24.0	04.2	-	14720	-	-	-	-	-	-
09/24/69	0800	13.0	25.0	04.1	057.2	16660	-	-	-	-	-	-
09/24/69	1405	10.0	25.0	04.2	058.9	17100	-	-	-	-	-	-
09/24/69	1827	-	25.0	03.8	-	17000	-	-	-	-	-	-
09/25/69	0050	-	25.0	03.3	-	16150	-	-	-	-	-	-
09/25/69	0740	08.0	25.0	02.4	033.2	16000	-	-	-	-	-	-
09/25/69	1425	08.0	25.5	01.9	026.5	16050	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E26S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0830	01.0	23.5	06.1	078.7	11640	-	-	-	-	-	-
09/23/69	1330	01.0	25.0	10.2	134.6	11220	-	-	-	-	-	-
09/23/69	1837	-	24.0	06.3	-	08780	-	-	-	-	-	-
09/24/69	0125	-	23.0	07.3	-	11850	-	-	-	-	-	-
09/24/69	0750	01.0	23.5	08.6	116.9	16680	-	-	-	-	-	-
09/24/69	1355	01.0	25.0	09.9	130.9	11400	-	-	-	-	-	-
09/24/69	1832	-	25.2	11.8	-	10300	-	-	-	-	-	-
09/25/69	0057	-	25.0	08.6	-	11200	-	-	-	-	-	-
09/25/69	0730	01.0	24.0	08.0	101.7	09250	-	-	-	-	-	-
09/25/69	1420	01.0	26.5	12.3	164.2	09750	-	-	-	-	-	-

STATION NO. E26M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0830	07.0	24.0	07.4	098.6	13860	-	-	-	-	-	-
09/23/69	1837	-	24.0	06.0	-	11000	-	-	-	-	-	-
09/24/69	0125	-	23.5	08.1	-	12170	-	-	-	-	-	-
09/24/69	0750	05.0	24.0	06.5	087.4	14750	-	-	-	-	-	-
09/24/69	1355	05.0	25.0	04.2	059.1	17500	-	-	-	-	-	-
09/24/69	1832	-	25.0	10.4	-	12500	-	-	-	-	-	-
09/25/69	0057	-	25.0	08.2	-	-	-	-	-	-	-	-
09/25/69	0730	05.5	25.0	05.8	080.2	15800	-	-	-	-	-	-
09/25/69	1420	05.0	26.0	08.5	117.0	13650	-	-	-	-	-	-

STATION NO. E24B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0830	13.0	25.0	05.6	077.6	15920	-	-	-	-	-	-
09/23/69	1330	10.0	25.0	06.1	084.5	15960	-	-	-	-	-	-
09/24/69	0125	-	24.0	04.6	-	15610	-	-	-	-	-	-
09/24/69	0750	10.0	25.0	04.2	056.0	12300	-	-	-	-	-	-
09/24/69	1355	10.0	25.5	04.1	057.7	16600	-	-	-	-	-	-
09/24/69	1832	-	25.0	03.8	-	17500	-	-	-	-	-	-
09/25/69	0057	-	25.0	03.4	-	-	-	-	-	-	-	-
09/25/69	0730	10.0	25.0	02.6	036.7	17870	-	-	-	-	-	-
09/25/69	1420	09.0	26.0	03.3	046.9	16500	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E27S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0815	01.0	24.0	06.0	078.3	11910	1.08	.04	.036	0.075	0.019	05
09/23/69	1345	01.0	25.0	10.6	141.6	12420	-	-	-	-	-	-
09/23/69	1815	-	24.0	10.9	-	10000	-	-	-	-	-	-
09/24/69	0135	-	23.0	07.9	-	11980	-	-	-	-	-	-
09/24/69	0735	01.0	24.0	07.8	106.7	16380	0.22	.07	.007	0.037	0.020	-
09/24/69	1345	01.0	25.5	09.5	128.5	12800	-	-	-	-	-	-
09/24/69	1837	-	25.2	11.4	-	11000	-	-	-	-	-	-
09/25/69	0105	-	25.0	10.3	-	11750	-	-	-	-	-	-
09/25/69	0715	01.0	24.0	08.6	110.7	10450	0.19	.05	.067	0.034	0.018	04
09/25/69	1400	01.0	27.0	07.3	-	-	-	-	-	-	-	-
09/25/69	1410	01.0	26.0	11.9	160.8	11800	-	-	-	-	-	-

STATION NO. E27M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0915	07.5	25.0	04.5	061.6	14900	0.38	.13	<.005	0.030	0.008	03
09/23/69	1345	06.0	25.0	06.6	090.2	14610	-	-	-	-	-	-
09/23/69	1815	-	24.0	11.1	-	10280	-	-	-	-	-	-
09/24/69	0735	05.5	24.0	06.8	091.3	14600	0.26	.20	<.005	0.034	0.024	08
09/24/69	1345	06.0	25.5	07.6	105.9	15700	-	-	-	-	-	-
09/24/69	1837	-	25.2	05.9	-	12300	-	-	-	-	-	-
09/25/69	0105	-	25.0	09.2	-	13450	-	-	-	-	-	-
09/25/69	0715	06.0	25.0	07.9	108.0	14670	0.19	.03	.018	0.042	0.016	05
09/25/69	1400	06.0	25.5	05.1	-	-	-	-	-	-	-	-

STATION NO. E27B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0815	14.0	25.0	-	-	16000	0.74	.20	.021	0.247	0.199	03
09/23/69	1345	11.0	25.5	04.9	068.4	15890	-	-	-	-	-	-
09/23/69	1815	-	24.0	04.6	-	15290	-	-	-	-	-	-
09/24/69	0135	-	23.5	04.7	-	15720	-	-	-	-	-	-
09/24/69	0735	11.0	24.5	04.1	-	-	0.23	.14	<.005	0.030	0.016	06
09/24/69	1345	11.0	25.0	04.1	057.4	16900	-	-	-	-	-	-
09/24/69	1837	-	25.0	04.0	-	16900	-	-	-	-	-	-
09/25/69	0105	-	25.0	04.3	-	15800	-	-	-	-	-	-
09/25/69	0715	11.0	24.5	02.9	041.2	19120	0.29	.16	.007	0.060	0.028	02

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E276

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/25/69	1400	11.0	25.5	02.4	-	-	-	-	-	-	-	-
09/25/69	1410	11.0	25.5	03.1	043.7	16800	-	-	-	-	-	-

STATION NO. E28S

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0800	01.0	23.5	07.8	100.9	11860	-	-	-	-	-	-
09/23/69	1310	01.0	25.0	10.4	139.2	12620	-	-	-	-	-	-
09/23/69	1800	-	24.0	09.0	-	11420	-	-	-	-	-	-
09/24/69	0725	01.0	23.5	07.9	103.3	12900	-	-	-	-	-	-
09/24/69	1330	01.0	25.0	06.2	084.0	13800	-	-	-	-	-	-
09/25/69	0110	-	25.0	11.7	-	10150	-	-	-	-	-	-
09/25/69	0700	01.0	24.0	09.2	118.6	10620	-	-	-	-	-	-

STATION NO. E28M

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0800	07.5	24.5	07.4	100.1	14540	-	-	-	-	-	-
09/23/69	1310	07.5	25.0	09.8	131.9	13150	-	-	-	-	-	-
09/23/69	1800	-	24.0	08.2	-	13660	-	-	-	-	-	-
09/24/69	0725	06.5	24.0	07.7	102.3	13650	-	-	-	-	-	-
09/24/69	1330	05.0	25.0	05.3	072.7	15000	-	-	-	-	-	-
09/25/69	0110	-	25.0	05.3	-	12450	-	-	-	-	-	-
09/25/69	0700	06.5	24.5	07.4	100.6	15010	-	-	-	-	-	-

APPENDIX II
SUMMARY OF DATA
ESCAMBIA BAY - 9/23/69 TO 9/25/69

STATION NO. E28B

DATE	TIME HRS	DEPTH FT	TEMP C	D.O. MG/L	D.O. %SAT	CL	TKN-N MG/L	NH3-N MG/L	NO2-NO3 MG/L	T-PHOS MG/L	O-PHOS MG/L	TOC MG/L
09/23/69	0800	14.0	25.0	04.7	065.4	16320	-	-	-	-	-	-
09/23/69	1310	14.0	25.0	08.2	112.1	14680	-	-	-	-	-	-
09/23/69	1800	-	24.0	05.7	-	14960	-	-	-	-	-	-
09/24/69	0725	12.0	25.0	04.3	060.3	17100	-	-	-	-	-	-
09/24/69	1330	09.0	25.5	03.7	052.3	17000	-	-	-	-	-	-
09/25/69	0110	-	25.0	05.7	-	16300	-	-	-	-	-	-
09/25/69	0700	12.0	24.5	03.1	044.6	20400	-	-	-	-	-	-

APPENDIX III

WASTE SOURCE SURVEY
SUMMARY OF DATA
ESCAMBIA BAY

Date	Flow (mgd)	Temperature (°C)	BOD 2-day (mg/1)	BOD 5-day (mg/1)	pH	Nitrogen Series Kjeldahl (mg/1)	Nitrogen Series NH_3 (mg/1)	Nitrogen Series NO_2-NO_3 (mg/1)	Phosphorus Series Total P (mg/1)	Phosphorus Series Ortho P (mg/1)	Total Organic Carbon (mg/1)
1969											
Container Corporation of America (A-1)											
9/17	36	25	25.6	28.5	7 3	1.36	0.12	0.005	0.520	0.242	39
9/17	36	25	24.8	32.0	7.2	1.46	0.16	0.030	0.490	0.244	36
9/18	36	24	3.5	11.3	7.3	1.12	0.15	< 0.005	0.520	0.262	34
9/19	36	24	12.5	19.5	7.3	2.14	2.08	0.010	0.520	0.247	34
9/19	36	26	14.5	23.0	7.5	2.41	1.15	0.015	0.490	0.220	34
9/20	36	29	16.4	34.2	7.3	1.42	0.20	< 0.005	0.450	0.247	31
American Cyanamid Company (A-3)											
9/10	4.7	32	50.8	117.2	7.8						
9/12	4.4	32	25.5	185.5	7.7						
9/13	4.3	33	30.9	93.5	8.0						
9/15	4.4	-	24.6	43.0	7.8						
9/16	4.4	35	21.0	186.5	7.9						
9/17	4.5					102	15.0	18.3	0.080	0.065	125
9/18	4.6	33	21.4	92.0	8.1	127	13.9	18.6	0.060	0.045	150
9/18	4.6					118	13.9	16.0	0.080	0.052	135
9/19	4.6					98	14.1	18.6	0.090	0.053	130
9/20	4.6					99	13.5	19.9	0.085	0.060	145

APPENDIX III (Continued)

WASTE SOURCE SURVEY
SUMMARY OF DATA
ESCAMBIA BAY

Date	Flow (mgd)	Temperature (^oC)	BOD 2-day (mg/1)	BOD 5-day (mg/1)	pH	Nitrogen Series Kjeldahl (mg/1)	Nitrogen Series NH_3 (mg/1)	Nitrogen Series NO_2-NO_3 (mg/1)	Phosphorus Series Total P (mg/1)	Phosphorus Series Ortho P (mg/1)	Total Organic Carbon (mg/1)
1969											
Escambia Chemical Company (A-5)											
9/10	4.7	28			6.5						
9/12	5.3	28			5.4						
9/13	5.3	31			6.6						
9/15	5.3	--			6.9						
9/16	5.3	31	2.7	7.8	6.6						
9/17	5.2					118	102	91.6	7.13	7.00	4
9/18	5.3	29	2.1	5.3	6.5	52.0	46.0	33.4	7.50	7.50	5
9/18	5.3					60.0	59.5	47.1	7.43	7.00	5
9/19	5.2					83.0	68.5	57.5	7.20	7.20	3
9/20	5.2					62.0	54.0	42.8	7.38	7.20	5
Monsanto Chemical Company (A-4)											
9/10	47.6	34	7.7	16.1	6.5						
9/12	49.2	35	17.5	27.7	7.4						
9/13	49.2	33	14.9	20.3	6.2						
9/15	47.6	--	19.7	26.3	6.8						
9/16	51.7	35	8.2	12.8	7.0						
9/17	50.2					3.00	1.94	1.28	0.490	0.390	9
9/18	59.5	33	10.3	20.3	6.5	2.57	1.21	1.82	0.662	0.565	6
9/19	63.5					3.50	1.70	2.77	0.470	0.212	11
9/20	54.3					6.45	4.35	5.00	1.40	0.915	6
(A-4a)											
9/12	1.9	33	60.4	90.6	7.1	2.62	2.12	2.60	4.25	0.865	6

APPENDIX III (Continued)

WASTE SOURCE SURVEY
SUMMARY OF DATA
ESCAMBIA BAY

Date	Flow (mgd)	Temperature (°C)	BOD 2-day (mg/l)	BOD 5-day (mg/l)	pH	Nitrogen Series Kjeldahl (mg/l)	Nitrogen Series NH_3 (mg/l)	Nitrogen Series NO_2-NO_3 (mg/l)	Phosphorus Series Total P (mg/l)	Phosphorus Series Ortho P (mg/l)	Total Organic Carbon (mg/l)
1969											
Northeast Sewage Treatment Plant (Pensacola) (A-6)											
9/10	1.0	27			6.9						
9/12	1.0	28	36.6	44.8	7.3						
9/13	1.0	28	55.0	90.6	7.5						
9/15	1.0	27	12.8	33.0	7.3						
9/16	1.0	28	24.8	70.4	7.7						
9/18	1.0	26	19.9	35.1	7.2	182	153	0.83	27.0	13.4	16
9/19	1.0					222	181	0.005	24.0	12.2	15

APPENDIX IV

ESCAMBIA RIVER CHEMICAL DATA

STA.	DEPTH	DATE	TIME	TEMP °C	D.O. (mg/ℓ)	pH	BOD_5 (mg/ℓ)	TOC (mg/ℓ)	COLOR (units)
C-1	mid., 2 ft.	10/27	0930	19.5	8.2	7.3	2.0	--	70
C-2	mid., 2 ft.	10/27	1100	20.0	8.1	7.1	0.8	--	75
C-3		9/15	1610	26	9.4	7.6	--	--	--
		9/16	1610	26	9.0	7.7	--	--	--
		9/19	1300	--	--	--	--	3	--
	mid., 2 ft.	10/27	1200	20.0	7.8	7.0	2.0	--	120
BE-4		9/15	1500	24	9.8	7.2	--	--	--
		9/16	1530	24	9.7	7.3	--	--	--
		9/19	1000	--	--	--	--	1	--
	Left, 2 ft.	10/27	1400	19.5	8.2	7.4	1.2	--	40
	mid., 2 ft.	10/27	1400	19.0	--	7.4	0.6	--	40
	rt., 2 ft.	10/27	1400	19.0	8.1	7.3	0.2	--	40
E-5		9/17	1210	--	6.2	7.3	--	3	--
		9/17	1730	25	6.2	7.4	--	3	--
		9/18	1000	24	6.0	7.4	--	4	--
		9/19	1035	25	6.6	7.7	--	3	--
		9/19	1500	26	6.3	7.6	--	3	--
		9/20	2400	23	5.8	7.7	--	4	--
	Left, 2 ft.	10/27	1630	20.5	7.2	7.2	1.4	--	120
	mid., 2 ft.	10/27	1630	20.5	7.1	7.2	1.2	--	40
	rt., 2 ft.	10/27	1630	20.5	7.2	7.3	1.8	--	110
E-6		9/17	1305	--	6.8	7.2	0.7	3	--
		9/17	1820	25	6.5	7.5	2.0	3	--
		9/18	0815	23	6.6	7.5	0.6	3	--
		9/19	1000	24	7.1	7.8	2.8	3	--
		9/19	1520	26	6.4	7.2	2.0	3	--
		9/21	0100	24	6.5	7.5	1.7	3	--
	mid., 2 ft.	10/27	1120	19.0	7.5	--	0.6	--	80
	7 ft.	10/27	1120	--	7.5	--	--	--	--
E-7	mid., 2 ft.	10/27	1200	19.5	6.8	--	0.6	--	65
	4½ ft.	10/27	1200	--	7.1	--	--	--	--
	8½ ft.	10/27	1200	--	7.2	--	--	--	--
E-8	mid., 2 ft.	10/27	1230	20.0	6.9	7.3	0.6	--	70
	6½ ft.	10/27	1230	--	6.9	--	--	--	--
	13 ft.	10/27	1230	--	5.2	7.3	--	--	--

APPENDIX IV (Continued)

ESCAMBIA RIVER CHEMICAL DATA

STA.	DEPTH	DATE	TIME	TEMP °C	D.O. (mg/ℓ)	pH	BOD_5 (mg/ℓ)	TOC (mg/ℓ)	COLOR (units)
E-9	mid., 2 ft.	10/27	1300	24.0	7.1	7.0	3.3	--	85
	8 ft.	10/27	1300	--	6.8	--	--	--	--
	16 ft.	10/27	1300	--	1.5	--	--	--	--
E-10	mid., 2 ft.	10/27	--	21.5	6.1	7.5	1.0	--	80
	7 ft.	10/27	--	--	5.6	--	--	--	--
	8½ ft.	10/27	--	--	4.7	--	--	--	--
	10 ft.	10/27	--	--	4.5	--	--	--	--
	14 ft.	10/27	--	21.5	3.0	7.5	--	--	--
W-11	mid., 2 ft.	10/27	--	20.0	6.9	7.6	1.2	--	60
	7 ft.	10/27	--	--	6.9	--	--	--	--
	14 ft.	10/27	--	--	6.5	--	--	--	--
E-12	mid., 2 ft.	10/27	1430	21.5	6.3	6.7	1.2	--	65
	7 ft.	10/27	1430	--	5.0	--	--	--	--
	14 ft.	10/27	1430	--	3.2	--	--	--	--
E-13	mid., 2 ft.	10/27	1445	--	6.2	--	1.2	--	60
E-14	mid., 2 ft.	10/27	--	--	5.6	--	0.8	--	60

APPENDIX V

LIST OF SPECIES
QUALITATIVE SAMPLES
OCTOBER 22, 1969

			STATION		
	C-1	C-2	C-3	BE-4	E-5
Porifera					
Spongilla sp.			X		
Amphipoda					
Crangonyx sp.	X				
Decapoda					
Astacidae		X	X	X	
Paleomonetas sp.				X	
Plecoptera					
Pteronarcys sp.		X			
Acroneuria sp.		X	X		
Neoperla clymene	X	X	X		X
Paragnetina sp.				X	X
Ephemeroptera					
Hexagenia munda marilandica	X				
Stenonema smithae	X	X	X	X	
Stenonema exiguum	X	X	X		X
Heptagenia sp.	X				X
Isonychia sp. A		X		X	
Baetisca gibberi		X			
Ephemerella sp.		X			
Tricorythodes albilineatus			X		

APPENDIX V (Continued)

LIST OF SPECIES
QUALITATIVE SAMPLES
OCTOBER 22, 1969

	STATION				
	C-1	C-2	C-3	BE-4	E-5
Caenis sp.				X	
Callibaetis pretiosus				X	
Baetis sp.	X	X		X	
Centroptilum sp.					X
Centroptilum viridocularis			X		
Anisoptera					
Progomphus sp.		X			
Erpetogomphus sp.			X		
Boyeria vinosa	X	X	X	X	X
Macromia sp.	X				
Macromia taeniolata				X	
Macromia allegheniensis				X	
Epicordulia princeps				X	
Neurocordulia molesta	X	X	X		X
Zygoptera					
Argia sp.			X	X	X
Argia apicalis		X			
Argia translata	X	X			
Enallagma sp.				X	
Neuroptera					
Corydalus cornutus	X		X		X

APPENDIX V (Continued)

LIST OF SPECIES
QUALITATIVE SAMPLES
OCTOBER 22, 1969

	STATION				
	C-1	C-2	C-3	BE-4	E-5
Trichoptera					
Hydropsyche sp.	X	X			X
Cheumatopsyche sp.	X	X			X
Polycentropus sp.				X	
Cyrnellus fraternus	X		X		X
Leptoceridae			X		
Lepidoptera					
Nymphula sp.				X	
Coleoptera					
Hydroporus sp.	X				
Hydrobius sp.			X	X	X
Sperchopsis sp.				X	
Helichus sp.					X
Ancyronyx variegatus		X	X	X	
Stenelmis sp.	X	X			X
Macronychus galbratus	X	X	X	X	X

APPENDIX V (Continued)

LIST OF SPECIES
QUALITATIVE SAMPLES
OCTOBER 22, 1969

	STATION				
	C-1	C-2	C-3	BE-4	E5
Diptera					
Labrundinia floridana			X		
Ablabesmyia janta			X	X	
Ablabesmyia (*ornata*)				X	
Ablabesmyia hauberi				X	
Ablabesmyia mallochi			X		
Brillia par		X			X
Nanocladius alternantherae		X			X
Orthocladius nr sp.2 - Roback		X		X	
Orthocladius sp. D - Beck					X
Cricotopus bicinctus		X			X
Cricotopus slossonae		X	X		
Cricotopus nr sp.2 - Roback		X		X	X
Trichocladius robacki	X				X
Psectrocladius sp. B - Beck				X	
Corynoneura (*Thienemaniella*) *xena*		X			
Ceratopogoninae					X
Tabanidae		X		X	

APPENDIX VI.1

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Nematoda	X			
Oligochaeta	X	X		X
Naididae	X			
Chaetogaster				X
Rhynchelmis sp.	X			
Cladocera				
Sida crystallina	X			
Copepoda	X			
Amphipoda				
Hyallela azteca	X			
Decapoda				
Astacidae			X	
Cambarus diogenes	X			
Orconectes sp.	X			
Plecoptera				
Taeniopteryx sp.	X			
Acroneuria sp.	X	X		
Neoperla clymene	X			X
Paragnetina sp.				X
Isoperla minuta	X			

APPENDIX VI (Continued)

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Ephemeroptera				
Hexagenia munda marilandica	X			
Stenonema smithae	X			X
Stenonema exiguum	X	X		X
Paraleptophlebia volitans	X			
Heptagenia sp.				X
Isonychia sp. A	X			X
Baetisca gibberi	X			
Ephemerella trilineata	X			
Tricorythodes albilineatus	X	X	X	X
Caenis sp.	X	X	X	
Caenis diminuta		X		
Baetis spiethi	X			
Baetis sp.				X
Centroptilum hohbsi		X		X
Centroptilum viridocularis			X	X
Cloeon rubropictum				X
Pseudocloeon bimaculatus				X
Caenis hilaris		X		
Anisoptera				
Dromogomphus spinosus	X			
Gomphus pallidus	X			
Macromia illinoensis	X			
Neurocordulia molesta		X		

APPENDIX VI (Continued)

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Zygoptera				
Argia sp.	X	X	X	X
Argia apicalis	X			
Argia translata	X			X
Agrion maculatum				X
Ishnura sp.	X			X
Hetaerina americana		X		
Neuroptera				
Corydalus cornutus	X	X	X	X
Climacia areolis		X		
Trichoptera				
Chimarra socia	X			
Hydropsyche sp.	X	X	X	X
Cheumatopsyche sp.	X			X
Leucotrichia sp.			X	
Polycentropus sp.	X			
Cyrnellus fraternus	X		X	X
Hydroptila sp.	X			X
Oecetis sp.	X			X
Triaenodes sp.		X		
Neuriclipsis sp.			X	

APPENDIX VI (Continued)

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Coleoptera				
Gyrinus sp.				X
Oreodytes sp.	X			
Helichus sp.			X	
Ancyronyx variegatus		X	X	X
Stenelmis sp.	X	X		X
Diptera				
Labrundinia floridana	X		X	X
Conchapelopia sp.		X		X
Ablabesmyia janta	X	X	X	X
Ablabesmyia auriensis	X			
Ablabesmyia (*ornata*)		X		
Ablabesmyia hauberi				X
Ablabesmyia mallochi	X	X	X	
Potthastia longimanus	X			
Pentaneura (*nilotanypus*) *sp*.		X		
Pentaneura inculta	X	X	X	X
Brillia par		X		
Nanocladius alternantherae	X	X	X	X
Orthocladius nr sp.2 - Roback	X			
Orthocladius sp. D - Beck	X			
Orthocladius sp.	X			

APPENDIX VI (Continued)

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Cricotopus bicinctus	X	X	X	X
Cricotopus slossonae			X	
Cricotopus nr sp.2 - Roback	X		X	X
Cricotopus sp.				X
Trichocladius robacki	X			X
Trichocladius sp.	X			
Corynoneura (*Thienemaniella*) *xena*	X			X
Corynoneura celeripes	X			X
Chironomus (*C*) *attenuatus*	X			
Chironomus (*Polypedilum*) *illinoense*		X		
Chironomus (*Dicrotendipes*) *modestus*		X	X	
Chironomus (*Xenochironomus*) *xenolabis*		X		
Chironomus (*Cryptochiromus*) *parafulvus*	X	X	X	
Parachironomus directus				X
Parachironomus sp.	X			
Parachironomus carinatus		X	X	X
Polypedilum (*Polypedilum*) *fallax*			X	
Polypedilum (*Polypedilum*) *illinoense*			X	X
Polypedilum (*Pentapedilum*) *tritum*	X		X	X
Polypedilum sp.	X			X
Phaenopsectra (*obediens*)	X			
Chironomi o. Beck	X			X
Microtendipes nr caducus	X			

APPENDIX VI (Continued)

LIST OF SPECIES COLLECTED IN ARTIFICIAL SUBSTRATE SAMPLERS
AT STATION E-5, CENTURY, FLORIDA

	1965	1966	1968	1969
Stictochironomus devinctus	X		X	X
Tanytarsus (*Rheotanytarsus*) *exiguus*	X	X		X
Tanytarsus glabrescens				X
Tanytarsus sp.	X	X		
Tanytarsus flavellus	X			
Tanytarsus guerla	X			
Tanytarsus sp.2 Roback	X			
Tanytarsus nr sp.1	X			
Tanytarsus sp.5 Roback	X			
Tanytarsus sp.a. Beck		X		
Chironomini L. Beck		X		
Gastropoda				
Physa sp.			X	
Ferissia sp.	X	X		X
Goniobasis sp.	X			X
Pelecypoda				
Corbicula fluminea	X	X	X	
Sphaerium sp.	X			

APPENDIX VII
ESCAMBIA RIVER NITROGEN AND PHOSPHORUS SERIES

Station Location	Date	Time (Hrs)	Nitrogen Series			Phosphorus Series	
			Kjeldahl (mg/l)	NH_3 (mg/l)	NO_2-NO_3 (mg/l)	Total P (mg/l)	Ortho P (mg/l)
Conecuh River @ US 29 (Brewton, Ala.)	9-19	1300	0.72	0.130	0.045	0.010	0.005
Conecuh River @ Pollard, Ala.	9-19	1410	0.83	0.125	0.020	0.055	0.024
Big Escambia Creek @ US 29-31 (Flomaton, Ala.)	9-19	1000	0.28	0.015	0.120	0.010	0.005
Escambia River @ Rt 4 (Century, Fla.)	9-16	1210	0.12	0.010	0.052	0.050	0.012
	9-17	1730	0.50	0.050	0.075	0.047	0.014
	9-18	1000	0.28	0.010	0.051	0.080	0.016
	9-19	1035	0.30	0.100	0.045	0.053	0.015
	9-19	1500	0.44	0.235	0.045	0.056	0.014
	9-20	2400	0.75	0.025	0.051	0.084	0.032
Escambia River @ Rt 184	9-17	1305	0.10	0.020	0.100	0.050	0.010
	9-17	1820	0.22	0.045	0.099	0.015	0.011
	9-18	0815	0.10	0.010	0.086	0.060	0.009
	9-19	1140	0.81	0.215	0.088	0.040	0.017
	9-19	1520	0.29	0.065	0.080	0.022	0.010